

Supply Chain Challenges in the High Tech Industry

*An analysis of an industry in transition
and a methodology to ride the Build-To-Order wave*



Adexa, Inc.

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Executive Summary

Constant innovation and changing market forces have transformed High Tech to the most competitive industry in the world economy. No other industry is challenged by a combination of

1. Price deflation, an average of 15% annually for top of the line products
2. Rapid depreciation of inventory assets
3. Shrinking product lifecycles (as short as six months)
4. Accelerating product proliferation, as high tech penetrates all aspects of our lives
5. Mass customization, each buyer can choose a unique set of the components and options for his PC
6. Evolving standards, all vendors must synchronize the design and introduction of their products to the standards defined by a handful of corporations such as Microsoft, Intel, and Cisco
7. Demand volatility, caused by product proliferation, economic downturns, and evolution of new markets
8. Eroding profit margins, due to rapid technological change and severe global competition

None of these trends will retreat in the future. The challenges emerging from these trends have prompted many suppliers, manufacturers and distributors to embrace new strategies to sustain their competitiveness and bottom line performance. Agility, cost reduction, drive towards high profit mixes and careful planning of key events form the centerpiece of these strategies.

The goal of agility is to promise, plan and respond to changes more quickly. By shrinking the planning and promising time, companies need to rely less on forecast thus can carry lower inventories. In addition, promising on-line or “while the customer is waiting” offers a strategic advantage. By shifting to consumer products, global high tech companies face customers that expect rapid delivery regardless of product complexity. These companies seek ways to promise customer orders in seconds using global available-to-promise and capable-to-promise logic. They need to create plans in minutes and tune them in seconds.

In order to achieve agility in operations, corporations are shifting their operations to a Build-To-Order mode. Cost reduction is the direct result of running an effective BTO operation. Major benefits are:

1. Inventory reduction, with the exception of a few strategic buffers there no need for finished goods and components in the pipeline.
2. Less exposure to demand volatility. with no inventory, the manufacturer is at less risk if the forecast is off the mark

3. Faster product transitions, absence of finished goods to clog the channel allows new products to reach the customer immediately.
4. Less obsolescence and depreciation cost, directly related to the decision not to stock any components or systems. This offers an opportunity to buy the component at a lower price whenever needed.

Challenges in shifting to a BTO discipline include:

1. Retain service levels with lower inventory
 - *Prevent stock outs by coordinating material supply and availability of manufacturing, transportation and storage resources.*
 - *Intelligent allocation of assets by channel, product line and customer*
2. Shrinking the lead times
 - *reduce planning time from days to minutes*
 - *coordinate assets to ensure a high velocity of material flow through out the supply chain*
 - *provide global visibility*
3. Offer reliable promises quickly.
 - *real-time global ATP and CTP functions*

The drive towards high-profit mixes requires intelligent profit optimization. This optimization considers both supply and demand constraints. The latter include price and volume projections. The former include component availability and component prices.

Key planning events include new product introduction and product transitions. Careful planning of events is attained through analysis and projection of channel inventory, component inventory, component availability, new product pricing and market demand.

With these capabilities, High Tech corporations can capture significant upside in revenue opportunities while achieving sustainable cost reductions and improve customer service levels. The key is how to make better decisions faster. Adexa solution and implementation services help high tech manufacturers deliver the speed and reliability in planning and optimization required to achieve dramatic improvements in supply chain performance. Only the Adexa solution offers

- Integration of planning intelligence required to accomplish global supply chain optimization.
- Ultra-high-speed global order promising and supply chain planning.

Introduction

Over the recent years, rapid technological change has redefined the landscape of competition in the high tech industry by shrinking product life cycles to as short as six months. While manufacturers are accelerating the rate of technology innovation, enabling a shorter window of opportunity to launch, ramp up, stabilize and phase out their products. Rapid price erosion can easily turn a potentially blockbuster product to a disaster. Coupled with demand volatility, ultra-high speed product introduction and transitions leave little margin for error.

Price erosion also feeds a frenzy by customers who pressure the manufacturers to gain immediate access to new products. Customers prefer to acquire products at the start of a lifecycle to maximize the time between required upgrades. Gateway responded to these concerns by pioneering a lease program that gives the consumer the option to return, own or upgrade the product following a period of use. Compaq, IBM and other PC manufacturers have offered similar programs to corporate customers. At the opposite end, some corporate customers demand to customize the product lifecycle by locking-in specific configurations beyond their lifecycle. They require a contract to ensure the manufacturer will pass the savings from component price deflation to them.

At the same time, price deflation discourages manufacturers and distributors from building ahead. Recent economic crisis in Asia and subsequent lower wages and dumping practices has exacerbated this trend. Companies, like Compaq, who held the most inventory in their channel endured significant losses.

Product design, manufacturing and launch in the high tech industry is more complex than ever. As high tech penetrates more aspects of our lives, new products and flavors are designed to address specific customer needs. Product proliferation and new market penetration coupled with standard interfaces has given rise to a mass customization trend. Companies like Gateway offer the consumer the choice to choose a unique set of components and options from a list. In addition, evolving standards has forced smaller vendors to synchronize the design and introduction of their products to the standards set by a handful of corporations such as Microsoft, Intel, and Cisco.

As high tech continues to penetrate our lives, it also becomes more and more subject to the same volatility and down turns as the rest of the economy.

None of these trends, which have increased the complexity of the management of the supply chain, are about to retreat in the future. The challenges brought about by these trends have prompted many suppliers, manufacturers and distributors to embrace new strategies to increase their competitiveness and improve their bottom line. Agility, cost reduction, selection of high profit mixes and careful planning of key events like new product introduction and product transitions form the centerpiece of these strategies.

Agility

The goal of agility is to promise, plan and respond to changes more quickly. By shrinking the planning and promising time, companies have to rely less on forecast and can carry lower inventories. In addition, promising on-line or while the customer is waiting represents a strategic advantage. Order promising is responsible for a major portion of the order-to-delivery cycle.

Traditional order promising involves promising available finished products from the main supply point. But what if available-to-promise from the main supply point is short? Advance order promising considers alternate sources of supply, projected supply from work-in-process, and capable-to-promise to complete the promise. Attaching constraints on how the customer wishes the products to be delivered further complicates order promising. Adexa's real-time ATP and CTP module can process and promise several hundred orders in the span of one minute.

Real-time CTP is highly incremental in nature. This means it avoids upsetting scheduling decisions that require new approval. Adexa supports a workflow to throw all promised orders into a sorter that re-optimizes the plan after a period of time. By setting the flex limits, business users manage the scope of re-optimization. For example, one organization might allow decisions to be refined as long as they don't interfere with the customer promises and supply commitments. A more cost-focused organization could allow supply decisions to be re-tuned as well, as long as they lead to a net cost saving. Adexa's ultra-high-speed planning helps create a globally re-optimized plan in minutes.

Adexa also alerts business users to demand or supply changes that throw the plan out of alignment. This early warning system provides the opportunity to respond to changes quickly while the choices are inexpensive and plenty.

Once business users apply a fix to an out-of-alignment plan, Adexa computes and presents the implications of the fix to the entire supply

chain. By running the fix in a “what-if” mode, users can weigh different fixes before committing to one.

Build-To-Order

In order to achieve agility in operations, corporations are shifting their operations to a Build-To-Order (BTO) mode. Cost reduction is the direct result of running an effective BTO operations. As a BTO pioneer, Dell computer has boasted a historical cost advantage of up to 15% over its competitors. In the past 2 years, IBM and HP and Compaq have adopted a similar business model by pushing the final assembly to their channel partners. While the cost advantage has shrunk, Dell and Gateway’s direct sales model continues to offer a cost advantage.

Major benefits of BTO include

- Inventory reduction: with the exception of few strategic buffers, no need for finished goods and components in the pipeline any longer. While the direct sales model is highly successful in the US, Dell has to rely on distributors overseas. With the addition of distributors to the supply chain, management of flow of products becomes more complicated. Unlike demand, supply is not well integrated with the PC supply chain. Even Dell maintains multiple weeks of stock of components between itself and its suppliers. To achieve the best inventory reduction results, one needs to take a holistic view of the supply chain management
- Less exposure to demand volatility: when there is no inventory, the risk of obsolescence is minimized.
- Faster product transitions: absence of finished goods to clog the channel allows new products to reach the customer, as soon they become available.
- Reduction in obsolescence and depreciation cost: directly related to the decision not to stock any components or systems. This offers an opportunity to buy the component at a lower price whenever needed.

Challenges involved in shifting to a BTO discipline include

- How to retain service levels when the inventory is greatly reduced
 - *Prevent stock outs by coordinating supply of material and availability of manufacturing, transportation and storage resources.* The number one reason for stock outs is that the plan has failed to account for all the constraints. Adexa’s supply chain and factory planning modules coordinate all supply chain assets so that material can flow smoothly through the supply chain.

- *Intelligent allocation of material and other assets by channel, product line and customer.* Adexa's intelligent allocation allows one to offer and manage different levels of customer service by product, region and customer. *Adexa gives the manufacturer the choice to anchor allocation on either components or systems.* Since many systems might use the same motherboard, hard disk drive or memory module, component allocation mitigates the effect of demand volatility on the manufacturer.
- How to shrink the lead times to make BTO a practical alternative.
 - *By reducing the planning time from days to minutes.* Some companies build fairly accurate plans but can't keep up with constantly tuning them. In fast moving industries like high tech, plans become obsolete as soon as they are created. By reducing the planning time across the supply chain from days to minutes, Adexa enables manufacturers will have a chance to respond to changes in demand or supply quickly.
 - *By coordinating all the assets to ensure a high velocity of material flow through all stages of the supply chain.* Stock outs is the main reason for out-of-sequence and slowdown of the flow of material. Adexa coordinates all the sets to reduce various queue and wait times.
 - *By providing global visibility to all stages of the supply chain.* This serves as an early warning system to alarm the user of the exceptions raised due to a change in the balance between demand and supply. Adexa offers global visibility and a unique collaborative strategy to globally re-optimize the plan.
- How to offer reliable promises quickly
 - *By providing global ATP and CTP functions in real-time.* If a Make-To-Stock environment leverages high levels of safety stock to simplify promising, MTO operations have to search all the way up to the suppliers to determine a realistic promise date. Adexa offers this function on a global basis and in real-time. Moreover, this function is fully integrated with allocation to ensure customers can be promised from their allocations. Adexa is capable of promising under various promising policies such as ASAP, JIT, compete and partial.

Since BTO offers an opportunity to lower operating cost while capture market share through better customer service, its

successful implementation presents a strategic advantage. Adexa's products can make the strategic difference.

Profit Maximization By Choosing the Optimal Mix

Shrinking margins has made profit maximization through choosing the optimal mix even a more important strategy. Selection of high profit mixes requires intelligent profit optimization. On the one hand, the price and volume curves have to be projected. On the other hand, component availability and component prices have to be charted.

In practice, profit optimization rarely begins with a clean slate. The first priority is to respect the current obligations. These include open and future business contracts to buy or sell a product. The algorithms also need to optimize within the framework of the corporation's business strategy. For example, the business strategy might call for venturing into a market that is not initially profitable.

Although profit maximization utilizes mathematical techniques, it needs to provide for user control. It also has to offer a warm start, the ability to adjust an optimization run after changing the values of a few parameters. This represents a warranty against long optimization runs when the results are accepted with some exceptions.

Adexa's offers:

- A warm start through special optimization techniques
- The ability to freeze selected results from a previous run, thus manually anchoring the optimization
- A way to respect existing buy or sell obligations

Event Planning

In the high tech industry, shrinking product lifecycles and the struggle to regain market share have made successful planning and execution of the introduction of new products more important than ever. By slimly beating competitors to market in introducing the Zip drive, Iomega became the defacto standard of the high-density external storage devices. High Tech manufacturers capitalize on being the first supplier of a product in order to sustain a high market share and set standards. By being first, manufacturers also deprive their competition from making significant profit on mature products. The strategy involves deep discounting on the mature product while keeping the price on the new generation steady. Heavy penalties are inevitable if the wrong decisions are made.

Launch of a new product requires many considerations:

- Compliance with the new standards set by such companies as Microsoft, Intel and Cisco.
- Timing that is aligned with the launch of core component or platform products like Windows® and processor chips.
- Marketing campaign.
- Product availability and distribution considering projection of demand over the introduction and ramp up horizon
- Product pricing considering the cost and margin targets
- Option and configurations

Adexa helps coordinate a concerted effort between a high tech manufacturer, its distributors and its suppliers. Given a launch date, Adexa determines the exceptions that rise due to unavailability of components and options. Adexa's product launch optimization allows manufacturers to balance between risk in the revenue opportunity by shifting the launch date and the additional cost incurred by keeping the date from moving.

High tech corporations also rely heavily on successful product transitions for their bottom line profit:

- By phasing out a product too early, they will fail to capitalize on the remaining revenue opportunity.
- Make-to-stock manufacturers or manufacturers with blanket procurement obligations might experience losses due to write down and obsolescence.
- When the channels of a manufacturer are clogged, the manufacturer might have to literally liquidate old products to clear them. Compaq, more recently, and IBM, several years ago, experienced tremendous one-time losses as a result of this problem.

Careful planning of events begins with accurate demand forecasts. Seagate and Western Digital, the leaders in the disk drive market, come to mind for underestimating the supply. Adexa's demand planner supports a collaborating forecasting process aimed at reducing forecast error. In doing so, it employs a truly multi-dimensional in-memory database that is capable of summarizing and allocating forecast down along product, geography, customer and time dimensions.

- Using an accurate demand forecast, manufacturers can use Adexa to Compare the cost of obsolescence for phase out schedules and supply targets. For example, if the price of a product falls rapidly toward the end of its life, the analysis will show that the

manufacturer is better off writing down stocks of the product's dedicated components than making new ones.

- Investigate how re-deploying FG and components across the distribution network can minimize the penalty of obsolescence. For example, if a mature product is still selling strongly in Europe, it might make sense to transship the product's FG inventory from a United States DC to Europe. If the product's components are unevenly distributed across the globe, it could be profitable to ship the components that are on the verge of obsolescence and Europe is short of to Europe. Europe could use these components to make new systems or stock them for after-market use.

Adexa's product transition optimizer will consider market demand, channel inventory, component availability, and product and component pricing to find a phase out date and a complete phase out plan that minimizes the cost obsolescence.

Global Supply Chain Integration

In order to improve the performance of a high tech supply chain, different components of the chain have to work in concert. Sales, forecasting, customer service, distribution, manufacturing, procurement and suppliers all need to collaborate to make decisions that considers the concerns of each while taking a global perspective. What is required to achieve such a tight integration?

- Global measurements
- Process reengineering
- Tools that enable true collaboration

Adexa's offers the only suite of products that is designed for supply chain integration and collaboration. In order to fully comprehend the goals of one another, all products within the suite embed a common data model. So if distribution establishes a goal for manufacturing to ship an order complete, manufacturing can fully comprehend the requirement. Moreover, manufacturing is aware how undesirable different deviations from this goal to the distribution are. For example, the customer might accept the order 10% short if all the line items are shipped proportionally.

In contrast, the architecture of other product suites prohibits them from truly global optimization. These suites have assembled products with un-equivalent representations. To overcome this weakness, they use an external common data model. Each time data is transferred, it is converted to and from the external data model. This limits the scalability of these applications and raises persistence and synchronization questions. The larger problem however is that

planning intelligence is lost during the transfer as the source and the destination speak in un-equivalent languages.

Adexa's Value Proposition and Solution

Adexa's value proposition for the high tech industry comprises of

- Reduction in the FG and component inventory across the supply chain
- Reduction in the cost of obsolescence
- Reduction in order promising and order-to-delivery cycle times
- Increase in profit margins from the sales of new products
- Increase in sales by capturing perishable demand and increasing the market share

A product strategy and a delivery methodology support this value proposition. Adexa's high tech delivery methodology is a roadmap to incrementally deliver value to the customer while minimizing implementation risk. This is to ensure that the project can pay for itself as it goes. The fact that all Adexa products are fully integrated reduces risk and removes the product as a delay factor. Adexa's high tech delivery methodology helps the customer reap benefit from the product even if the quality of data is poor or customer's supply chain operations lack integration with partners.

Adexa's product strategy is three folds:

- Increase velocity of flow of products through the supply chain
- Improve demand planning
- Improve management of demand and supply by aligning the two together

The in-memory embedded common data model of Adexa is designed to increase the velocity of promising, planning and responding to changes by a factor of two to three orders of magnitude. Promises are formulated in seconds and consider global available-to-promise and capable-to-promise. Adexa's intelligent optimization modules create globally optimal supply chain plans in minutes. Adexa's unique embedded common data model is pivotal to speedy global optimization.

Adexa offers real-time global visibility to all stages of the supply chain as a way to accelerate responses. This will reduce the level of safety stock needed. Adexa's Supply chain monitor serves as an early warning system to alarm the user of the exceptions raised due to a change in the balance between demand and supply. Adexa offers a unique collaborative strategy to globally re-optimize the plan.

Adexa supports a collaborative demand planning workflow. The product allows users to plan events like

- New product introduction
- Phasing out a mature product
- Offer a promotion

Adexa allows demand to be defined at any intersection of geography, channel, product and customer. One can then use Adexa to allocate down or roll up demand across the entire multi-dimensional demand hierarchy.

With the proliferation of end item configurations, it becomes very difficult to forecast at the end item level. Adexa supports component level or “base” system forecast. The user has the choice to drive the forecast for various assembly modules and options by defining an “attach rate” for each.

To improve management of demand, Adexa supports

- Segmentation of demand by geography, channel, product and customer and serving each at the desired level of service
- Allocation of FG or Components to demand by geography, channel, product and customer
- Ultra-high-speed individual or mass order promising
- Can-do logic to determine how quickly an order can be delivered incrementally
- Collaborative channel management

The management of supply is improved by offering

- Modeling of global dynamic sourcing
- Coordination of material and capacity
- Global optimization of manufacturing, transportation and distribution
- Collaborative supplier management
- Optimization based on alternate components
- Logic to handle effectivity based engineering change notices
- Logic to handle component use up effectivity
- Logic to handle time varying yield
- End-of-life and obsolescence analysis
- Supplier contract management

Adexa supports reconciliation of demand and supply by optimizing assets to meet demand at the desired level of service. If the supply exceeds demand, Adexa helps convert this opportunity to sales. If demand exceeds supply, Adexa helps intelligently allocate supply to demand.

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