

# SUCCESSFUL RISK MANAGEMENT IN THE ELECTRONICS SUPPLY CHAIN

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*How QAD Solutions Address Today's Electronics Industry Challenges*

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## EXECUTIVE SUMMARY

The entire nature of demand is changing, placing unprecedented demands on forecasting accuracy. In fact, long-range planning and forecasting are increasingly losing their ability to guide manufacturers.

Today, manufacturers must seek lower risk levels by focusing on what products customers want – in pull-based fashion. This places a high emphasis on smarter supply chain execution in the near-term. Whether it's electronics components, electronic systems, or electrical products, manufacturers must reduce expense lines, improve supply chain efficiency, and plan collaboratively with partners to reduce: Inventory Risk, Supply-Interruption Risk, and Sarbanes-Oxley Non-Compliance Risk. The proper supply chain infrastructure to meet these objectives includes:

- Pull-based inventory Replenishment
- Inventory Visibility
- Faster Information Lead Times
- Sales and Operations Planning
- Managing Key Performance Indicators
- Managing Inter-Enterprise Business Processes
- Lean Manufacturing
- Service and Support Management
- Support for Sarbanes-Oxley Compliance

## THE FACTORS CREATING RISK IN THE SUPPLY CHAIN

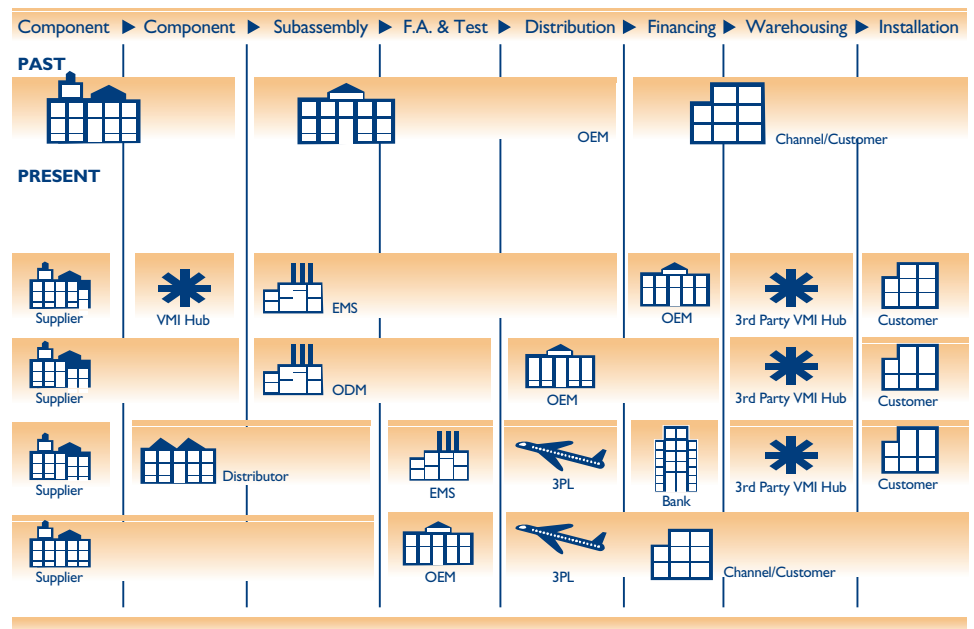
More than ever before, electronics manufacturers are facing harsh realities. With further dismantling of trade barriers, globalization is now enabling companies to enter new markets – each with its own standards and regulations – creating fragmented product lines and distributed networks of suppliers and vendors. Product innovation is receiving greater emphasis as global competitors turn up the heat and product lifecycles continue to shrink. Pricing pressure is an industry-wide phenomenon, stemming from pricing-focused – not value-focused – procurement professionals.

What's more, the entire nature of demand has changed, placing traditional forecasting accuracy squarely in the cross-hairs. The fact is, long-range planning and demand forecasting are increasingly and inherently losing their ability to guide manufacturers – as the recent inventory crisis in electronics showed all too clearly.

Instead, of creating inaccurate forecasts, companies must simplify using a pull-based mechanism. Manufacturers must focus on knowing which products customers want and when the customers want them – not on the products manufacturers have available and the timeframes that manufacturers can commit to. Achieving lower risk requires smarter supply chain execution in the near-term.

In response, technology manufacturers are turning to outsourcing to maximize their product spend, while reducing and distributing risk throughout the supply chain. With the introduction of partners such as electronics manufacturing services (EMS) providers, component suppliers and distributors, original design manufacturers (ODMs), contract design manufacturers (CDMs), and other participants, it becomes more challenging to control that network of suppliers. Although original equipment manufacturers (OEMs) still have direct design relationships with the semiconductor

suppliers, the purchasing relationship comes about through the OEMs' partners, making inventory ownership ambiguous, blurring inventory visibility across the supply chain, and creating unstructured processes among partners for managing supply chain execution.



**Figure 1:** With the growing complexity in the supply chain, electronics manufacturers look for ways to distribute risk.

### Different Market Segments, Different Challenges

The electronics supply chain has evolved into a complex network of various stakeholders. This fragmentation and increased outsourcing creates an intricate set of challenges that can be broken down by industry segment.

### ELECTRONIC COMPONENTS MARKET

For makers of electronic components – integrated circuits, active components (such as transistors, diodes, and power devices), and passive components (including capacitors, inductors, crystals, and connectors) – manufacturing processes continue to relocate to lower-cost labor countries in Eastern Europe, Asia, and South America. Customers are shifting from single-part to multi-part vendors for supplier rationalization and interoperability – while componentization of products increases modular configurations. The key competitive issues:

- Replacing commodity sales with niche products, customized solutions, and value-add services
- Product innovation and finding high-growth markets for rapid-lifecycle products
- Lower pricing by driving more cost out of processes (even as raw material costs increase)
- Production yield – highest product quality at faster throughput times and lower costs
- Accurate order promising or guaranteed next day shipment
- Inventory management so that the right inventory is in the right region at the right time as demand changes
- Supplier-managed inventories, vendor-managed inventories, and consignment inventories
- Worldwide service consistency

## ELECTRONIC SYSTEMS MARKET

Today, OEMs and contract electronics manufacturers (often called electronic manufacturing service providers) are far less willing to accept ownership of materials and components until they're actually delivered. Many OEMs are divesting their production facilities to their contract manufacturers as global outsourcing continues to accelerate. As product lifecycles shrink, product obsolescence and retooling become critical. Other key competitive drivers include:

- Lower costs, faster delivery, localized specialization, and production flexibility
- Full-service design and production
- Product innovation and use of microelectronics - leading to higher product complexity
- Speed of development and production time-to-market
- Visibility and improvement of contract subassembly, tester and/or final assembly operations and output
- Competitive pricing

## ELECTRICAL PRODUCTS MARKET

These products – often sourced as to-build components of industrial, automotive, commercial, or consumer products – are seeing a shift to solution selling, emphasizing greater reliability, lower TCO, and design improvements. Raw material costs are increasing and as companies cope with recent downturns, they are decreasing manufacturing capacity through higher utilization and cycle time performance. Product sourcing is changing in this market and further product-line rationalization is taking advantage of low-cost areas of supply and productivity improvements. From a competitive perspective, companies are looking at several issues:

- End-to-end program management (the so-called “vertical integration” of engineering, sales, manufacturing, and service)
- Time-to-market
- Ease of doing business through online catalogs, RFQs, storefronts, and call centers
- Flexible responsiveness to changing order requirements and last-minute engineering changes
- Competitive pricing

## IT'S ALL ABOUT RISK

Facing difficult economic conditions, manufacturers in all segments need to reduce expense lines, improve the operation of their supply chain, and plan collaboratively with partners. Most long-term planning, however, ends with account management activities; tactical plans are seldom connected with the execution. Companies that bridge the gap between the ERP and supply chain execution with partners through collaborative processes can reduce costs, inventory risks, and cycle times, while improving service.

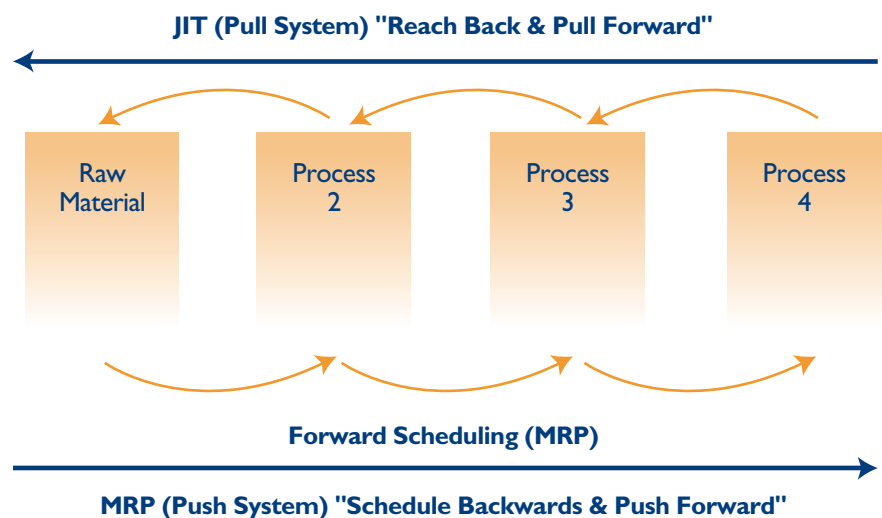
In order to stay competitive under these economic conditions, electronics manufacturers need to effectively manage their extended supply chain which includes customers, suppliers, 3PLs, and EMSs. This requires end-to-end business solutions that seamlessly combine standard enterprise resource planning (ERP) capabilities with supply chain execution allowing organizations to manage the virtual supply chain in real-time.

The last industry downturn exposed the nature and extent of these problems through all major segments — chiefly through the huge inventory overhang that was created. The unprecedented volatility in demand planning and inventory are the very essence of supply chain risk. How does risk manifest itself in the electronics supply chain?

- **Inventory Risk** - This is the greatest risk for supply chains - getting caught holding inventory when a product becomes obsolete or demand shifts unexpectedly. With the highly volatile demand of electronics manufacturing, companies that rely heavily on demand-forecast accuracy face unnecessary inventory risks.
- **Supply-Interruption Risk** - Conversely, no company wants to experience materials shortages that impact their ability to supply finished product to their customers. Supply interruptions are the ultimate opportunity cost for manufacturers.
- **Capacity Risk** - In the cyclical electronics industry, most profits arise from new orders during a peak cycle coinciding with price premiums. Too little capacity presents significant opportunity costs. Conversely, excess capacity can negate the profits gained in the peak period.
- **Sarbanes-Oxley Non-Compliance Risk** - CIOs are responsible for the infrastructure that companies use to manage, monitor, report, and forecast the business. They need to document all decisions that can impact company financials. For example, an engineering change that affects pricing decisions could be subject to a future audit. The vast majority of CIOs understand that achieving a high degree of confidence in these matters will require significant IT changes.

To safeguard against these and other risks in the future, companies must adopt a far-reaching framework that not only clearly defines financial ownership of the material, but also establishes inventory visibility and a risk-management process between the partners.

What's more, electronics manufacturers must take the bolder step to evolve beyond relying on demand-forecast – the classic push model – and replace it with newer pull replenishment techniques. In other words, they must shift the emphasis from long-term demand planning and forecasting to shorter-term supply chain execution based on customer demand pull.



**Figure 2:** A pull based system is always triggered by actual customer demand (Process 4) causing downstream processes to produce only if needed. Push systems always run a chance of over-production.

Creating such a supply-chain infrastructure requires access to inventory data, demand and supply plans, commitments, orders, shipments, and a system that allows management by exception. More properly, this means

- Pull Replenishment
- Inventory Visibility
- Faster Information Lead Times
- Sales and Operations Planning
- Managing Key Performance Indicators
- Managing Inter-Enterprise Business Processes
- Lean Manufacturing
- Service and Support Management
- Support for Sarbanes-Oxley Compliance

**HOW QAD HELPS  
ELECTRONICS  
MANUFACTURERS  
REDUCE AND  
MANAGE RISK**

In response to electronics manufacturers' persistent yet evolving needs to manage and reduce risk, QAD has developed and offers a suite of comprehensive enterprise applications.

One of the company's flagship solutions – MFG/PRO eB2 – is a software backbone that enables collaborative execution across the manufacturing supply chain, directly addressing the challenges described in the beginning sections of this paper.

Developed with feedback from QAD's customers and leveraging more than 23 years of experience in delivering solutions to global manufacturers, MFG/PRO eB2 addresses the most crucial demands facing today's global manufacturers:

- Supporting a pull-based manufacturing and replenishment environment
- Achieving inventory visibility across fragmented supply chains including multiple tiers and component suppliers and contract manufacturers
- Minimizing supply interruptions by reducing information lead time
- Comprehensive sales and operations planning (S&OP) to optimize inventory at various points in the supply chain
- Monitoring supply chain KPIs including supplier and contract performance
- Managing outsourcing operations
- Supporting lean manufacturing and lean supply chain strategies
- Creating aggregated supply plans to drive strategic sourcing

**QAD HELPS  
ELECTRONICS  
MANUFACTURERS  
MANAGE RISK THROUGH  
SOLUTIONS IN THE  
FOLLOWING AREAS:**

**PULL REPLENISHMENT**

For many electronics manufacturers, the long-term demand-forecasting process is no longer sufficient because it is too vulnerable to short-term variability. As a result, many companies are using a "pull replenishment" model. Pull replenishment uses inventory buffers – based on demand forecasts – to smooth out unforeseen variability in the demand curve.

Replenishment orders are placed based on movement of materials triggered by actual customer orders. Those replenishment orders may be sent out electronically down the supply chain or could represent signals for internal movement of components or products.

**INVENTORY VISIBILITY**

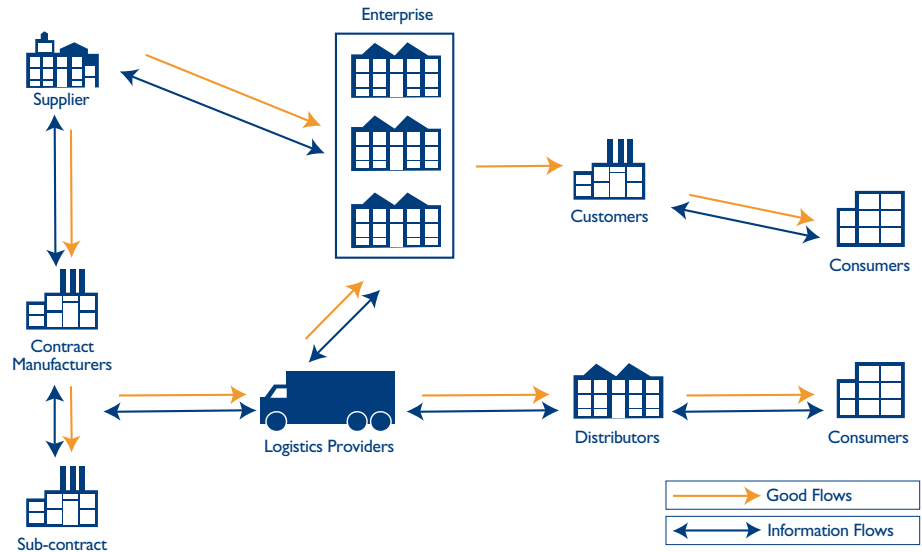
Electronics manufacturers need 100-percent partner connectivity to achieve visibility into inventory across a fragmented supply chain. This is particularly difficult, since

most chains include multiple tiers and component suppliers and contract manufacturers.

QAD gives authorized suppliers real-time visibility into inventory and order data and allows them to monitor how items are being consumed to determine the timing and volume for stock replenishments. This is an ideal solution for vendor-managed inventory scenarios.

Suppliers can track inventory from the customer's Web site as often as every five minutes and receive e-mail or pager alerts if inventory levels exceed defined limits.

This kind of real-time inventory information drives down inventory levels and administrative costs for all participants.



**Figure 3:** With the proliferation of the number of roles in the electronics supply chain, the flow of information becomes essential for the supply chain to stay competitive.

### FASTER INFORMATION LEAD TIMES

Electronics manufacturers must minimize the risk of supply interruptions by shortening information lead times and latency of information sharing across the supply chain. This is important because information lead time has a direct correlation with inventory levels.

Longer lead times require higher inventory buffer levels. By contrast, accelerating information lead-times can significantly reduce inventory levels and increase inventory turns.

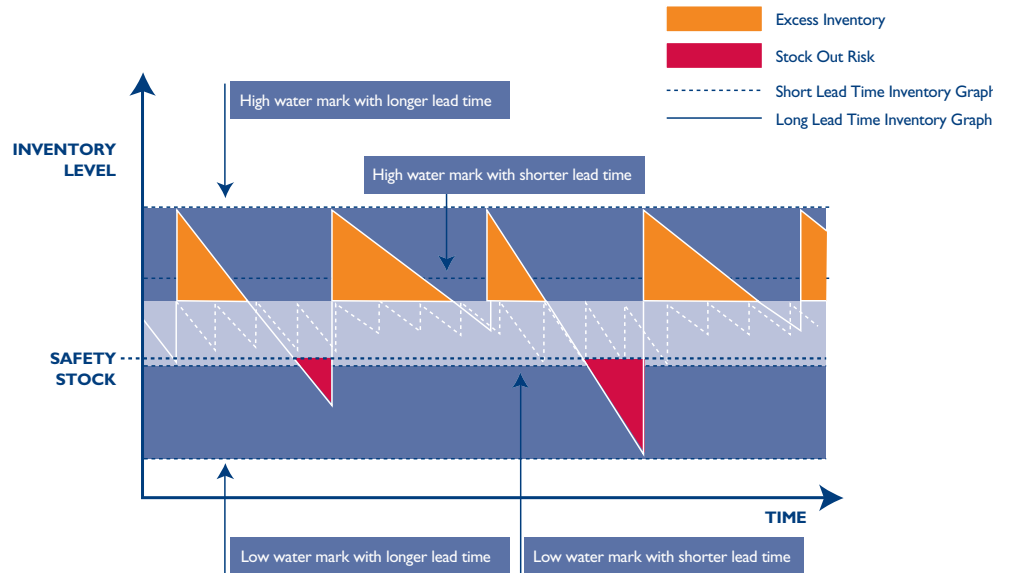
Traditional EDI carries an inherent delay (though far less than manual methods such as phone, fax, or e-mail communications). However, coupling EDI with Internet-based inventory visibility applications can give manufacturers 100-percent electronic connectivity with trading partners and enable real-time collaboration.

QAD EDI ECommerce is a powerful module for transaction mapping and data conditioning that easily accommodates trading partners in a variety of business environments, providing a streamlined method of managing EDI communications between MFG/PRO and those of its trading partners. EDI ECommerce can receive

an order signal via a traditional EDI transaction such as an incoming purchase order or a replenishment signal. EDI can also receive XML- or Internet-based order signals.

In addition, the ability to schedule and manufacture unique product configurations on an item-by-item basis helps manufacturers produce products that meet specific customer feature demands and still keep production stocks to an absolute minimum.

As the diagram below shows, lengthy information lead times create negative effects, including having to carry excess inventory and an increased risk of stock outs.



**Figure 4:** Long information lead times not only lead to higher inventory levels but also increase the risk of stock outs.

## SALES AND OPERATIONS PLANNING

Although manufacturing execution is never driven by sales and operations planning, this plan creates a longer-term view of constraints, resource requirements, and supplier capacities. QAD enables electronics manufacturers to create a comprehensive sales and operations plan by:

- Arriving at a consensus forecast based on various forecast streams from customers, sales, marketing, and other stakeholders.
- Creating component forecasts and providing a mechanism to share this information with suppliers.
- Identifying imbalances, bottlenecks, and shortages before they occur.

## MANAGING KEY PERFORMANCE INDICATORS

To embody a philosophy of both accountability and continuous improvement, efficient manufacturers must carefully monitor the metrics that are indicators of not only supplier and contract performance – but the internal corporate performance as well. QAD tracks these “key performance indicators” (KPIs) in a variety of areas:

- Financial KPIs
  - Days sales outstanding (DSO)
  - Days payment outstanding (DPO)
  - Average selling price
  - Cost of goods sold (COGS)

- Process Management KPIs
  - Yield and scrap rates
  - Actual and theoretical lead times
  - Forecast accuracy
  - Manufacturing cycle time
  - On-time delivery rate
- Inventory Management
  - Cost of inventory
  - Finished goods inventory turns
  - Work-in-process inventory turns
- Service and Support Management
  - Returns per sales
  - Number of calls by product
  - Number of calls by customer
  - Warranty cost to sales ratio by product
  - Warranty cost to sales ratio by customer
  - Call center effectiveness
- Providing mechanisms to monitor supply chain KPIs including supplier and contract performance

## MANAGING INTER-ENTERPRISE BUSINESS PROCESSES

For electronics manufacturers, managing outsourcing operations is a data-intensive challenge requiring visibility to data from multiple sources and locations. QAD can provide a centrally accessible service point for manufacturers and suppliers to connect and share information in a collaborative exchange.

One key area of inter-enterprise collaboration is vendor-managed inventory, where the supplier maintains agreed-upon inventory levels of materials and components. By providing the supplier with access to real-time demand information, the buyer can reduce administrative costs, overhead levels, and stock shortages.

QAD's consignment solution lets you recognize inventory ownership at the point of consumption. This makes processing less costly because inventory is received from suppliers as consigned goods, without the actual transfer of title. The supplier maintains the consigned goods as finished goods inventory until a notice is generated that the inventory has been used.

When a buyer does not take title to material until it is actually used in manufacturing, raw material and purchased parts inventories are, in effect, eliminated. This increases inventory turns and the use of capital assets.

## LEAN MANUFACTURING

An efficient response to fluctuating customer demand requires real-time analysis and the monitoring of lean parameters based on actual demand, future requirements, and the state of readiness of the extended supply chain. To help electronics manufacturers respond, QAD's Lean Manufacturing functionality controls the creation and management of the life cycle of time-phased production schedules in a flow-driven, lean manufacturing environment.

QAD Lean Manufacturing synchronizes manufacturing processes with the extended supply chain and responds to changes in demand and supply, allowing manufacturers to monitor customer demand, alert, and adjust lean manufacturing and supply chain parameters when changes occur.

Lean Manufacturing sends kanban signals within the plant or to suppliers through EDI or the Internet to downstream operations. Kanban signals and Internet-based kanban visualization facilitate lean manufacturing by making accurate inventory replenishment information immediately visible, reducing information lead-time and eliminating waste in the flow of material from suppliers to customers.

The QAD Lean Manufacturing module allows suppliers to manage fluctuating customer demand and complex variation in product mix, facilitates supplier collaboration, and minimizes inventory carrying costs.

### SERVICE AND SUPPORT

QAD offers a Service and Support Management (SSM) module that dramatically improves the speed of service, support, product returns, or exchange activities. Returns, repairs, and replacements are often important elements of an electronics manufacturing business. How well they are performed directly affects customer satisfaction. QAD's service and support solution manages the entire process based on specific terms, coverage percentages, and time limits stated in the applicable warranty.

QAD also supports comprehensive call-center management, including management of customer calls, service visits, calls by field technicians – or any other contacts with customers or potential customers. For electronics companies that service the equipment they sell, the mobile field services component of this solution improves the speed and accuracy of service activities and reporting from the field.

### SARBANES-OXLEY COMPLIANCE

QAD solutions provide a framework to support a business intelligence cockpit where business executives can monitor and track all key performance indicators (KPIs). QAD provides complete audit trails on transactions performed as well as an appropriate security model. This is essential for documenting compliance with provisions of Sarbanes-Oxley (SOX).

SOX requires manufacturers to be more accountable for controls and visibility across the entire business. This is especially true for issues categorized as “event risk,” which requires companies to have full visibility into events that impact revenue, demand forecasts, supply shortages, and more.

- **Automated SOX reporting** - Ensure your financial disclosures contain all relevant information
- **Purchasing commitments toward material** - Know about materially significant shortages of components or raw materials that could impact your business.
- **Assets acquired by suppliers** - Under SOX, you're responsible for having detailed knowledge about your supply chain.
- **Contract information** - QAD helps you get the complete picture regarding volume guarantees, use-or-pay capacity requirements, and other contractual obligations from forecasts and orders.
- **Inventory** - You need to know inventory ownerships and liabilities across the supply chain.

### THE QAD ADVANTAGE

QAD provides a pull based manufacturing and replenishment solution that helps reduce inventory risk, reduce lead time, and increase inventory turns. QAD ties the intra-enterprise business processes (ERP) to the inter-enterprise business processes (supply chain execution). In other words, companies can manage internal operations

and operations with contract manufacturers, suppliers, and customers within the same solution suite, resulting in better control over the inventory across the supply chain, lower overall inventory levels, leading to better return on assets. The QAD solution supports the entire inventory management process, eliminating waste and streamlining processes throughout.

- Alerts and Simulation — To manage the extended supply chain and to respond effectively to changes in demand, suppliers need a solution that can monitor customer demand, alert, and adjust manufacturing parameters in real-time when changes occur. Fluctuating customer demand requires real-time analysis of different scenarios based on actual demand, future requirements and the state of readiness of the extended supply chain.
- 100-Percent Partner Connectivity — To succeed in today's environment, organizations must be able to share information at a revolutionary pace. The key is to eliminate the delays inherent in traditional EDI, phone, fax or e-mail communications and make information available to everyone simultaneously, enabling 100% partner connectivity throughout the supply chain. Coupling EDI with Internet-based inventory visualization applications can give manufacturers 100% electronic connectivity with their trading partners and enable near real-time collaboration and alerting with their supply chain.
- Easier Collaboration — The QAD solution makes it possible to collaborate near real-time with all suppliers, large and small, without any manual effort or paperwork. QAD solutions support traditional EDI, XML, Internet-based visualization and alerting for exception-based management. The fully integrated QAD Lean Supply Chain solution includes all the options necessary for inventory replenishment and partner connectivity and the critically important financial settlement options required in the automotive industry.
- Cost and Time Savings — In addition to providing a broader offering than other solutions, the QAD integrated solution has time and cost advantages. Choosing an integrated inventory replenishment solution eliminates the need to implement individual solutions for specific processes and reduces the cost of upgrades. A unique advantage of the QAD Supply Chain Solution is that additions and upgrades will always be integrated with QAD's base ERP solution, MFG/PRO.

## **CONCLUSION**

A proper supply chain infrastructure plays an extraordinarily significant and strategic role in almost every area of electronics manufacturing - from Pull Replenishment and Inventory Visibility to Inter-Enterprise Processes. QAD solutions are ideally positioned to help companies respond to the need to reduce risk.

In a study completed in January 2003, the META Group examined the value propositions of the leading manufacturing software vendors based on information gathered from more than 200 of the vendors' customer companies. Their results confirmed that QAD provides:

- Lowest cost of ownership
- Fastest time to implement
- Highest value

*“We chose MFG/PRO because we felt it is clearly one of the more simple, elegant and easy-to-install ERP packages available. We probably had one of the quickest QAD implementations on record. Just eight weeks after receiving the software we were up and running in both US divisions.”*

**- Instrument Specialties (now part of Laird Technologies)**

*“Our aim was to create a streamlined system that integrated our factory and commercial office financial reporting. MFG/PRO was the only fully local option. It also cost the least and had the best reference documentation I’ve ever seen.”*

**- Philips Electronics & Lighting**

*“MFG/PRO offered us the scalability as well as the breadth of product functionality. We could really go into each country and pick and choose the functionality we needed, knowing that the local requirements would be met as well as the corporate objectives.*

**- Rockwell Automation**

### **About QAD**

QAD enterprise applications leverage advances in Internet and enabling technologies to provide critical functionality for managing manufacturing resources and operations within and beyond the enterprise, enabling global manufacturers to collaborate with their customers, suppliers and partners to make and deliver the right product, at the right cost and at the right time. Manufacturers of automotive, consumer products, electronics, food and beverage, industrial and medical products use QAD applications at approximately 5,200 licensed sites in more than 80 countries and in as many as 26 languages. For more information about QAD, telephone +1 805 684 6614, or visit the QAD Web site at: [www.qad.com](http://www.qad.com).

## **APPENDIX CASE STUDIES**

### **Index of QAD Case Studies**

[http://www.qad.com/company/publications/case\\_studies/](http://www.qad.com/company/publications/case_studies/)

### **Indigo America**

[http://www.qad.com/company/publications/case\\_studies/electronics/indigo\\_america.pdf](http://www.qad.com/company/publications/case_studies/electronics/indigo_america.pdf)

### **Oticon A/S**

[http://www.qad.com/company/publications/case\\_studies/electronics/oticon.pdf](http://www.qad.com/company/publications/case_studies/electronics/oticon.pdf)

### **Philips Electronics & Lighting Inc.**

[http://www.qad.com/company/publications/case\\_studies/electronics/philips.pdf](http://www.qad.com/company/publications/case_studies/electronics/philips.pdf)

### **Shanghai SEB Electrical**

[http://www.qad.com/company/publications/case\\_studies/electronics/shanghai\\_seb.pdf](http://www.qad.com/company/publications/case_studies/electronics/shanghai_seb.pdf)

## **OTHER RESOURCES**

### **“META Group names QAD ERP value leader”**

<http://www.qad.com/company/news/metagroup.html>

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**A Passion For Manufacturing**