



Perhaps more than any other industry, high-tech manufacturers have abided by the rule that there are only two kinds of companies: the quick and the dead. This industry's manufacturing practices push the envelope of innovation, competition and commoditization.

Globalization is accelerating the rate of contract manufacturing and outsourced operations. Political events and competition for resources only add to the operational volatility and uncertainty in gauging demand. Yet, even in a growth cycle, high-tech manufacturers must not only face the risks of their markets, but also keep a tight rein on costs and process integration if they are to assume control over their supply chain participation, and also gain visibility into opportunities so they can act on them.

Until recently, many high-tech manufacturers – especially small and medium-sized businesses – have been able to survive by the 80/20 rule, where they applied 80% of their operational focus to 20% or less of their critical customers and suppliers. That was then. The new mandate from channel masters is for more intense, collaborative relationships with fewer suppliers. They are driving to a new demand-driven value network. In this environment, suppliers must increase performance in product development, lifecycle management, quality and total cost of ownership.

To succeed, manufacturers must shift from a reactive posture to a proactive one. By embracing cost-efficient business practices that will make them more adaptive to market shifts, companies can gain control and seize market opportunity. These practices are based on five Critical Success Factors (CSFs):

- Dynamic market responsiveness
- Value network collaboration
- Product lifecycle management
- Value-driven performance
- Sustainable cost controls

These factors are interdependent, as are the enterprise activities required to achieve them. In fact, integrated business processes are the key to achieving these five CSFs. And sustaining the revamped business processes will require a unified view of the extended enterprise. To stay in control and capture new opportunity with speed and confidence, high-tech manufacturers need integrated enterprise systems to sustain their process improvements and control profit margins.

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## The Five Critical Success Factors

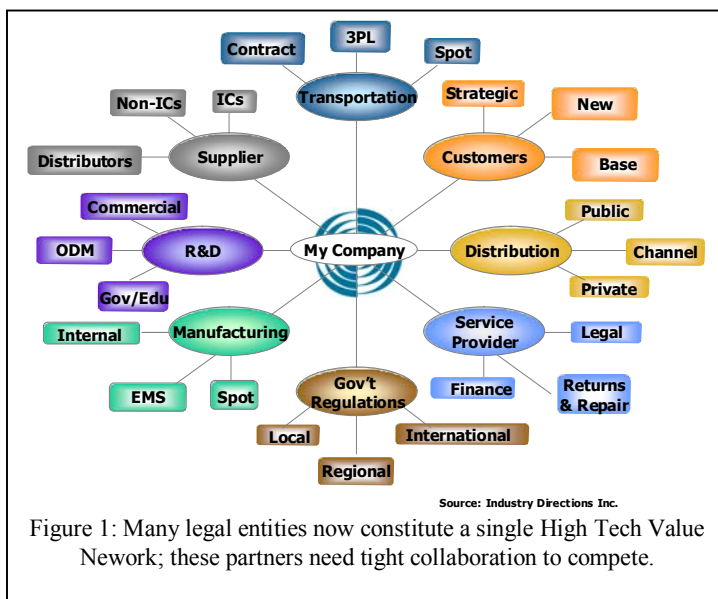
Most high-tech sectors – whether Original Equipment Manufacturers (OEMs), electronics manufacturing services (EMSs), suppliers of systems, components or semiconductors – all share a common set of characteristics. These include rapid technology changes that challenge accurate production planning, an increasing number of products and components for varied and global customer segments, competition for global supply and demand sources, and well-established production outsourcing for chips, boards and systems. The five CSFs not only help manufacturers retain control over their role in the ecosystem but also enable them to identify and act on opportunities amidst the market’s cyclic ups and downs.

### 1. Dynamic Market Responsiveness

Today’s high-tech manufacturers must have visibility into supply and demand chain activities to gain first-to-market advantage. Agile response cannot be the domain of a single department. While marketing or sales may develop a new application area, design, procurement, inventory management, manufacturing, distribution, suppliers and outsource partners must coordinate their efforts nearly instantly to capture a leading position.

Inventory must flow rapidly and responsively through the entire supply chain. Pull-driven demand replenishment such as Just-in-Time (JIT) and Vendor Managed Inventory (VMI) is critical to prevent untimely stock-outs or product obsolescence.

Another key element for agility is the ability to quickly implement engineering changes, which may originate in many corners of the value network. Whether change comes from engineering, customers or suppliers, companies must be able to smoothly and rapidly communicate and implement changes for rapid response at the product level.



### 2. Value Network Collaboration

Collaboration is the lynchpin to the agile value network. Customers must provide accurate and timely input regarding how many of what products they want and when they want them, while suppliers are critical to cost control and delivering the innovation for next-generation products. Further, collaboration has enabled high-tech manufacturers to operate as a highly efficient value network (Figure 1), reducing the burden of assets and fixed costs. What started with contract

manufacturing (CM) has expanded to product design and manufacturing such as EMS, including outsourcing of services from design (Original Design Services or ODS) and procurement to logistics, after-sale service, systems integration (SI) and delivery.

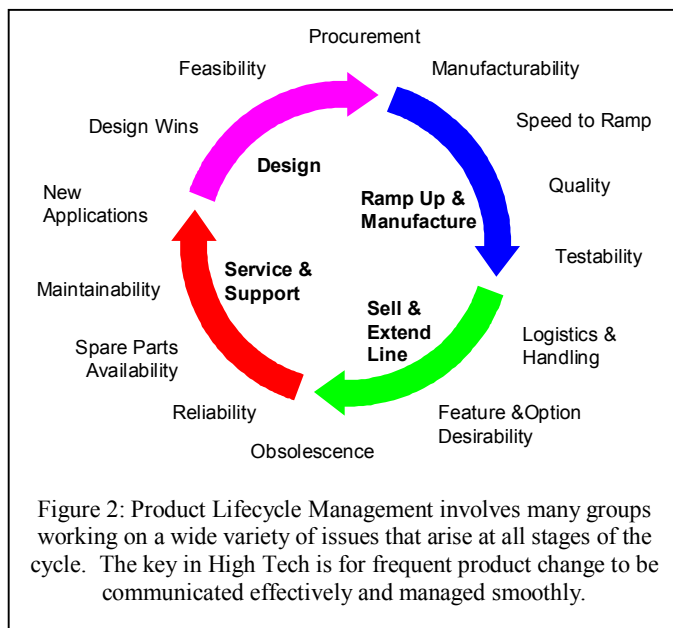
Companies must manage and synchronize operations from a local and dispersed basis. This requires visibility and secure access to the critical pieces of the value network a company does not own. Further, electronics manufacturers must manage multiple sales channels and global operations, which require a local presence for sales and service. Partners need effective ways to collaborate on forecasts to avoid the “bullwhip effect” and to identify and respond to market opportunities as they arise.

### 3. Product Lifecycle Management

Product Lifecycle Management (PLM) entails some special issues for high tech, such as merging mechanical and electronic designs, responding to frequent engineering changes and establishing appropriate access for each player in the value network. This drives cross-enterprise PLM – keeping the product fresh at all times in its lifecycle (Figure 2).

The speed of product innovation is also critical for companies to meet the market window of opportunity. This applies to component suppliers looking for design wins and OEMs seeking the high-profit first-to-market position. A key aspect of this is Design for Manufacturability or Assembly (DFM/ DFA) that drives specifications for lower-cost production or faster ramp-up to full volume and early quality. Again, this requires synchronization between design, procurement, manufacturing, suppliers and customers.

Once in production, collaboration with suppliers such as coordinating inventories and operations is essential to keeping products moving into the market. While end items change frequently, components and thus subsystems also change on their own schedules.



This requires companies to move products in and out of the lineup at each level of the bill of material. The manufacturer must control inventory effectively through these lifecycle changes or face enormous risk.

Short product lifecycles make after-sales service particularly challenging. Repairs often require parts and expertise that do not apply to the current product line. Yet, if managed well, service and support can be highly profitable for a company or its partners. Warranty and other after-market issues are indicators of design, manufacturing and distribution issues.

Companies need the means to correlate service activities back to design for current and future model design.

**4. Value-Driven Performance**

To gain customer satisfaction and loyalty in a constantly shifting market, high-tech companies must be extremely responsive to customers and open with them about the changes they foresee. However, customer satisfaction must not come at the expense of margins. As the original product lines age, every group must work to ensure the whole business does not slip into commodity status.

To offer a more complete solution to customers, many companies are bundling services with products – and finding partners in the value network whose products, services or expertise will enhance customer value. For example, many contract manufacturers now go beyond board and box build to offer design, procurement, inventory and logistics services. Instrument and control makers may provide remote diagnostics and service. PC and cell phone companies use local partners to provide quick-response service.

Perhaps one of the most critical elements of value-driven performance is envisioning or creating market trends. The value network that is first to market with innovations enjoys the benefits of higher margins and market leadership. Companies that enable this market leadership can gain considerable leverage and control.

**5. Sustainable Cost Controls**

As high-tech growth returns, companies must stay vigilant to costs of R&D, manufacturing and inventory to stay competitive. This calls for sharing information across the virtual enterprise that reduces inventory volatility and the costs associated with product design, materials procurement and supply chain management.

Another area of sustainable cost savings is ongoing increases in efficiency through automating processes. Automated processes eliminate errors and increase quality and reliability – not only of products but also of all activities in the enterprise. Another productivity-enhancing initiative is outsourcing, which we’ll explore in the next section.

<b>CRITICAL SUCCESS FACTORS</b>	<b>PROCESS INTEGRATION</b>
Dynamic Market Responsiveness	Integration across decision-making, planning, execution and feedback
Value Network Collaboration	Integration among trading partners and across departments
Product Lifecycle Management	Integration across departments, partners and through time
Value-Driven Performance	Integration across customers and channel partners, with analysis
Sustainable Cost Controls	Integration across departments Closed loop feedback on results

**The Integrated Process Imperative**

Fiercely competitive and fast-moving high-tech markets quickly reward those that look for opportunity and act on it, leaving the rest behind. To achieve control and be poised to seize new opportunities, manufacturers

Figure 3: Achieving each of the Five Critical Success Factors relies heavily on some aspect of integrated business processes.

must take a proactive approach toward integrating and automating key processes with their trading partners. Creating integrated processes that connect departments, partners, decisions, product lifecycles and channels throughout the value network is a foundation for achieving the CSFs (Figure 3).

**Cross-Department:** Processes must integrate multiple departments to fully understand cost interdependencies, collaborate, act quickly, manage product lifecycles and keep margins high.

**Among Trading Partners:** High-tech manufacturers have realized that outsourcing and other supply chain partnerships are ideally a win-win situation. OEMs must help EMS partners achieve lower costs, increase flexibility and improve market performance. Only with this foundation can the EMS provide greater market competitiveness as well as a lower capital asset base.

**Closing the Decision-to-Result Loop:** Agility requires processes that incorporate decision-making, planning, execution and feedback on results. This “closed loop” process ensures that decisions and plans rest firmly on current capability to execute those plans, and reflect the actual impacts of prior decisions. It also ensures that activities are based on the latest plans and decisions for the entire enterprise. This prevents the local vs. global disconnects that will occur frequently without constant vigilance.

**Closing the Design-to-Retire Loop:** To manage frequent product and unit lifecycles, value networks must close a different kind of loop – one that moves through time. This loop ensures that as-designed, as-built and as-serviced records can be reconciled over the lifetime of a product, with a serialized genealogy.

**Across Channels and Customers:** To keep customers and shareholders satisfied, the process must integrate various departments with all sales channels, customers and, in

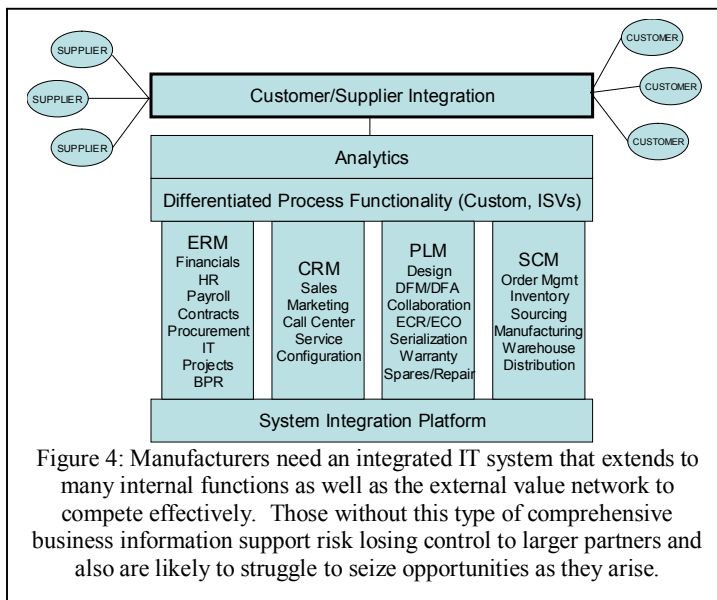


Figure 4: Manufacturers need an integrated IT system that extends to many internal functions as well as the external value network to compete effectively. Those without this type of comprehensive business information support risk losing control to larger partners and also are likely to struggle to seize opportunities as they arise.

some cases, customers’ customers. Since every group in the value network has a bearing on eventual revenues and profits, processes must reach beyond sales and marketing teams to include procurement, manufacturing, finance and legal departments.

**Integrated System Support**

Going forward, businesses of all sizes must establish an integrated and unified application structure to support synchronized and responsive business processes (Figure 4). Obviously, mid-

market and smaller high-tech manufacturers cannot build and support the IT infrastructure in the same manner as a very large enterprise. The challenge for mid-market high-tech manufacturers -- as well as for the application providers that service them -- is how to grow users from an Excel spreadsheet-driven system into a robust and flexible application structure in a sustainable fashion.

The ideal approach for mid-market companies would be to work from a flexible, modular platform that supports the following functional components:

- Demand planning and forecasting
- Inventory management & visibility, including VMI
- Product lifecycle management
- Collaborative design and engineering
- Supplier and buyer collaboration
- Multi-mode manufacturing

Further, the solutions should be specifically designed to support the complex processes of high-tech manufacturing via the vendor, ISV add-on components or web services to integrate to other systems. Software support may be specific to a segment such as fabless semiconductor or include special functionality to accommodate electronics industry regulations such as WEEE and RoHS.

Finally, the software must be embraced by the users. One of the best ways to ensuring use is to integrate to or even be front-ended by the familiar desktop environment of Internet browsers, Excel spreadsheets, Office applications and Windows. This also helps provide a synchronized view of each user's situation in the larger business context.

### **Proactively Adapt or Die**

In a globally competitive business environment, it isn't enough to compete against other companies for business. Now, value networks compete against other value networks. For each member of the value network, how good its processes are and how well its processes flow will determine performance. This in turn will determine whether the company can assume control over its relationships and leverage the opportunities that arrive for it and its trading partners.

Those that continually and proactively improve against the five Critical Success Factors will survive and succeed by embracing integrated processes that enable dynamic market responsiveness; foster collaboration across the value network; execute effective product lifecycle management; support coordinated value-driven performance; and sustain cost controls that reduce waste and support growth.

Successful mid-market high-tech manufacturers will have adopted an integrated system environment that gives them more control to be proactive. These companies will create and sustain their operational effectiveness via low-cost, responsive, profitable operations

across their value networks. They will manage ever-shorter product lifecycles as the market works through its own cycles. Those using disjointed or point solutions will find it difficult to gain visibility into their own or their customers' and suppliers' business processes, or stay in step with plans, constraints or opportunities as they arise.

Many market leaders are already creating integrated processes and setting metrics to ensure progress toward the five high-tech CSFs. Companies using integrated enterprise systems will be able to support business processes for response, collaboration, lifecycle management, value-driven performance and cost containment. In high tech, where companies are constantly being cataloged into the quick or the dead, hesitation to act is no longer an option.

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