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Transforming Cost Management

Five Elements of a Winning Approach that Make Innovation Affordable and Sustainable in High Tech & Electronics

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Executive Summary

During the economic downturn of 2008-2009, costs have been a primary focus. For many, this has been a cost-cutting exercise to "compensate for" an abnormal situation. What if, as many economists believe, the market never returns to its previous state? There are indicators that some high technology segments will continue to see demand volatility, increased regulation, slower growth due to continued tight credit, and continually squeezed margins even through the economic recovery and subsequent cycles.

If this is the "new normal," cost management gains importance. Even in growth times, everyone in the enterprise will need to build forward-looking cost factors into decisions. In fact, many electronics companies focus cost management on direct materials and product costs, but this is just the beginning. From R&D to supply, manufacturing, distribution, service, and responsible end-of-life disposal, costs accrue throughout the product lifecycle and the electronics industry network of trading partners.

Nothing should be assumed. Cost impacts need to be analyzed not only on a single aspect, but for the entire product, portfolio and business. All of that must be through the lens of value to the customer.

The five elements of a winning cost management strategy are:

1. Information-rich enterprise-wide and industry network visibility & cooperation
2. Full lifecycle cost consideration
3. Demand-driven, lean practices based on customer requirements for value
4. Proactive, multi-faceted cost analysis
5. Accountability based on holistic, continuous views of cost

With this approach, cost consciousness guides and sustains innovation, rather than limiting it. As market leaders begin to adopt this approach, the competitors' cost challenges will only rise.

This cannot be the responsibility of accountants or even operations managers. Rather, executives must manage the entire end-to-end business process and pull multiple departments together. Beyond providing leadership through a cultural transformation, executives must also ensure that managers in every department have access to all the information they need to make sound decisions and continually monitor outcomes. Product lifecycle management (PLM) capable of handling technical as well as business data is, in our view, the most likely platform to support this style of cost management.

Cost management has always been an important management tool, but the approach most companies take today is proving inadequate. In short, electronics companies must transform cost management to be comprehensive, proactive, pervasive, and continuous.

Cost challenges in electronics

Most electronics and high tech companies retain relatively thin margins considering that the products are constantly improving in performance and require sophisticated design and production capabilities. (See Figure 1.) A number of factors contribute to the cost side of this margin equation.

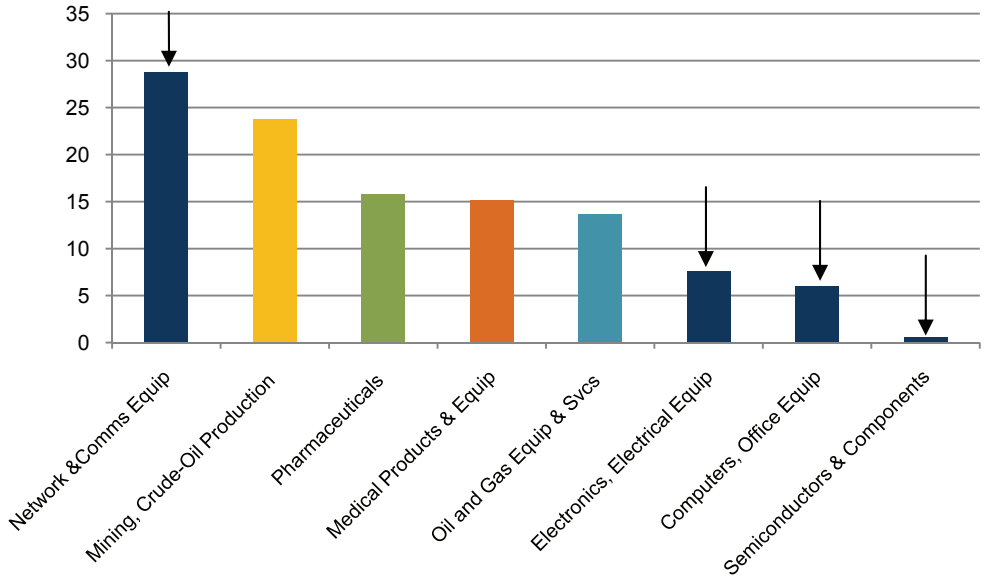


Figure 1: With the exception of networking players, high tech companies' margins are thin compared to many other manufacturing industries.

Speed: Moore's Law ensures short product lifecycles and the expectation of ever-lower prices for electronics. Speed of new product introduction (NPI) can be pivotal to revenues and margins. This demands careful management of costs, but also poses enormous issues in every department due to constant change.

Product Complexity: High tech and electronic products typically involve electronics, application software, firmware, and mechanical elements, incorporating a range of materials and requiring a deep bill of materials. This complexity can be a source of incremental cost – extra procedures are required to ensure everything integrates seamlessly; or, in the worst case, any mistake can cause confusion, delay and rapid growth of unplanned costs.

Globalization: The worldwide nature of demand and supply creates not only supply chain costs, but also complexity in operations, finance, and calculating costs and revenues in light of currency fluctuations. Companies also incur costs to protect their intellectual property in far-flung regions.

Localization: Each country will require products to have native language documentation and appropriate electrical connections. Customer tastes and requirements also vary by region. All of this adds significantly to the number of products, parts, and activities.

Regulations: The electronics industry has come under increased regulations in recent years, which again vary by region. This is leading to changes in materials, to a need for complete product genealogy through the value network, and strategies for end-of-life product disposal.

Interdependencies: Lowering costs in one area can cause enterprise or lifecycle costs to rise. Historically, many new designs did not fully account for the constraints of the manufacturing and distribution facilities, thus raising overall costs. Another common example is a new supplier's lower prices being offset by different support or warranty conditions and the expense of having an additional supplier in the system.

Aligning costs with objectives

Costs are just one aspect of business performance that a company will want to optimize. Other issues to balance include speed of NPI, flexibility to meet specific customer requirements as they change, reliability of products and of revenue streams, and compliance risk reduction. With all of that in mind, aligning cost management throughout an organization becomes a major challenge.

One aspect is ensuring that all efforts support the goals and metrics for the business coming from the boardroom. For example, some companies are seeking first-to-market leadership, while others have fostered a brand reputation for leading-edge performance that commands a premium, and yet others focus on partnering with customers for unique applications. Each of these suggests a particular approach to cost management and areas where tradeoffs may land in favour of higher costs.

The business impacts are myriad and flow throughout an electronics enterprise. One of the major challenges is that most of the people making those decisions cannot see these tradeoffs clearly, in the context of the business strategy and total enterprise.

Current cost management not up to success in the "new normal"

Companies will need to face a new reality. Economies and thus product demand will be more volatile, and buyers' tastes and requirements may change faster than ever. The footprint of regulation is likely to continue to expand. The logical result of less predictable revenues combined with higher compliance and agility requirements: a severe margin squeeze.

Cost management gains in importance in this "new normal" environment. Businesses need the ability to manage, not just cut, costs on an ongoing basis. While typical cost management involves checking vendor lists, focusing on areas where costs have been high in the recent past, or asking those in various operational areas to curb costs, success will require a dramatically new approach.. The reality of business volatility highlights several significant problems with many companies' approach to cost management:

- It begins too late in the cost lifecycle to have full impact.
- It is localized to specific departments, product lines, programs, or initiatives.
- It fails to encompass the entire lifecycle and clearly show how decisions in one area impact costs in another.
- It defines costs in ways that may not reflect customer value and requirements.

- It is reactive and mainly based on historical data, current contracts, and transactions.
- It is based on assumptions such and rules of thumb which don't always prove to be accurate in a holistic view.
- It is based on incomplete information, which thwarts effective analysis.
- It occurs episodically in annual budget cycles and specific NPI cycles, not continuously.

A winning approach to cost management

Electronics industry leaders are already adjusting their cost management practices to ensure that they learn to excel in the "new normal." These companies are moving from a focus on cost cutting to a holistic focus on managing and balancing costs through the lifecycle, across the enterprise and across the value network.

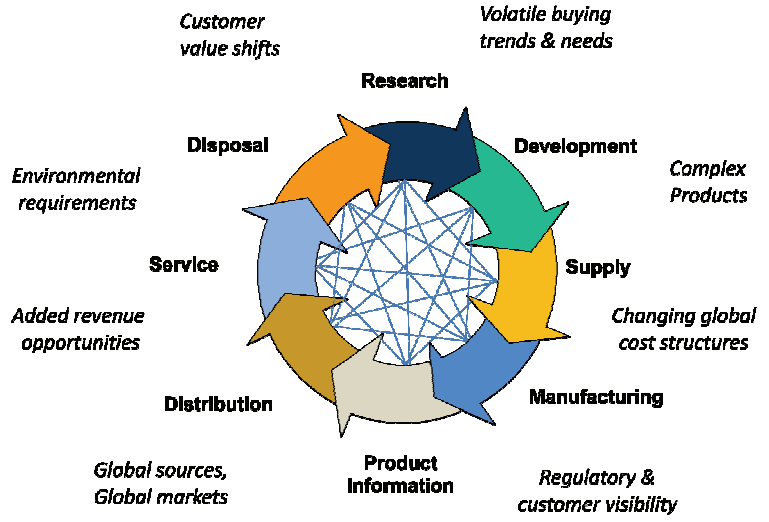


Figure 2: Costs and revenue potential are intertwined at each stage of the lifecycle for electronics products. External factors common in the "new normal" make comprehensive, continuous cost views more critical.

Each of these cost elements is usually considered, but often not in a comprehensive, enterprise-wide, and forward-looking way. The competitive factors in high technology business now demand this new lifecycle view of costs. (See Figure 2.)

As leaders' new cost management practices take hold, their performance increases will accelerate pressure on everyone else in the industry. We consolidate these practices into five aspects that companies can leverage to transform cost management into a strategic capability.

1. Information-rich enterprise-wide and industry network visibility & cooperation
2. Full lifecycle cost consideration
3. Demand-driven, lean practices based on customer requirements for value
4. Proactive, multi-faceted cost analysis
5. Accountability based on holistic, continuous views of cost

While these concepts are not new, many have not been applied fully to cost management. Most high tech companies can improve their cost structures as well as the sustainability of their innovation efforts by implementing these effectively.

1. Enterprise-wide and industry network visibility & cooperation

Taking a comprehensive, integrated approach to cost management is more difficult than it sounds. Supplier consolidation and spend analysis must be conducted in a way that examines the enterprise-wide cost tradeoffs. True enterprise supplier management links practices into corporate strategies and objectives, and then drives spend, budget appropriations, and score carding accordingly.

Electronics companies should manage network partners and internal operations in the same way, with the same systems. Holding everyone to similar standards and leveraging not only common processes, but shared information in secure ways, can begin to illuminate issues that keep costs stubbornly high.

Keeping costs low also demands a deep and interactive view of both in-house and partner capability for specialized materials and activities. Beyond commodity prices, this involves understanding all of the indirect cost implications of decisions. Design and manufacturing are the obvious partners, but procurement, distribution, warehousing, finance, sales and marketing might all have insights into where cost savings might lie.

2. Full lifecycle cost management

The lifecycle of costs as described above should be treated holistically for maximum success. Each of the elements must be addressed individually and as they relate to each other. (See Figure 2.) This again sounds obvious, but is not common practice today – few companies have the capability and a forum to analyze, discuss, and make strategic lifecycle cost trade-offs.

R&D costs: Beyond individual engineer productivity, cost management will consider program and resource cost management. Product cost views must move beyond a single product or product line to encompass costs across the product portfolio. Developing platform strategies can significantly improve design, procurement, production and localization costs.

Direct costs: High tech firms must fully employ materials, parts, and sub-assembly standardization and re-use strategies earlier in the lifecycle than purchasing. Cost analysis must move beyond parts, to the total network of production, testing, outsourcing, distribution, and demand generation that contribute to COGS.

Information costs: Leaders are positioning to exceed regulatory and customer compliance demands for information with a product delivery. Product track and trace has always been important in electronics, but ease (and thus cost) of capture must improve. The number of roles and entities likely to need product genealogy data continues to increase. Information collection and communication can operate in parallel to physical product creation, and the associated costs need to be integrated to provide a more complete view.

Service costs: Companies must control the cost of service and disposal of products after sale. With WEEE in force, recycling must be built into product design. For those with a business line in service, a full genealogy including quality issues and previous repair is critical to profitable operations. Reliability and remote monitoring capabilities may add initial cost, but be recovered during the service lifecycle of a product.

3. Customer-value-driven, lean practices

Throughout a company, lean and value-driven approaches can keep a focus on what matters to customers, reduce waste, and thus keep costs in check. Keeping customer requirements, feature requests, and needs in mind is the foundation for defining waste. Cost should be incurred only to ensure and increase customer value.

Lean initiatives will also identify situations where a faster response will save cost. A correct immediate decision almost always results in lower costs than a delayed decision, For example, a quick sound decision reduces the cost of resources wasted through reassignment or confusion while waiting for a delayed decision.

Lean development tends to focus on product and process costs, including cost of quality for both new products and upgrades. Some of the common practices include design for manufacturing and assembly (DFM/DFA) to leverage production process capabilities; design for six sigma (DFSS) to ensure product and process quality; design for supply chain (DFSC) to streamline supply, packaging, and handling; and design for environment (DFE) working to ensure sustainable products and processes.

In R&D, customer-driven lean practices lead to value engineering. This ensures that products not only meet market requirements, but maximize the customers' value from deploying them. It also leads to better decisions for new products, and across the product portfolio. Ensuring that market requirements and operations constraints are continuously factored in to design decisions helps lower costs through testing and the rest of the lifecycle.

4. Proactive, fact-based cost analytics

Clearly, having complete cost and waste views across the enterprise, product lifecycle, and industry network forms a solid foundation for cost analysis. It is no surprise that more complete views render more effective analysis of business impacts. However, even with complete views, there are further improvements to cost analysis.

One of the most fundamental transformations in cost management is the shift from historical and current views to future and theoretical views. Leaders are leveraging proactive and predictive views of costs.

One example is what-if scenario analysis to gauge the cost and other business trade-off impacts of various product and portfolio decisions. Another is creating the ability for staff to understand cost overrun risks and manage them more effectively. Yet another involves ensuring that products in a concept stage meet future business objectives.

5. Accountability based on holistic, continuous views of cost

Working on any one of the first four aspects can improve a company's performance to cost metrics. However, working them all together on an ongoing basis has the highest potential for dramatic impact.

In fact, they clearly can improve each other. Having both a total lifecycle and an enterprise-wide view begins to define the comprehensive view of cost. Some of those issues will become clear only

through cooperation. If those are viewed through demand-driven and lean lenses, the chances increase that products and the entire portfolio of products hit both customer needs and cost targets. Analytics that are forward-looking are critical to the ability to generate lower costs and sustainable margins, even in the "new normal." Finally, ensuring that cost management is a continuous process ensures alignment with strategy and effectiveness in constantly changing conditions.

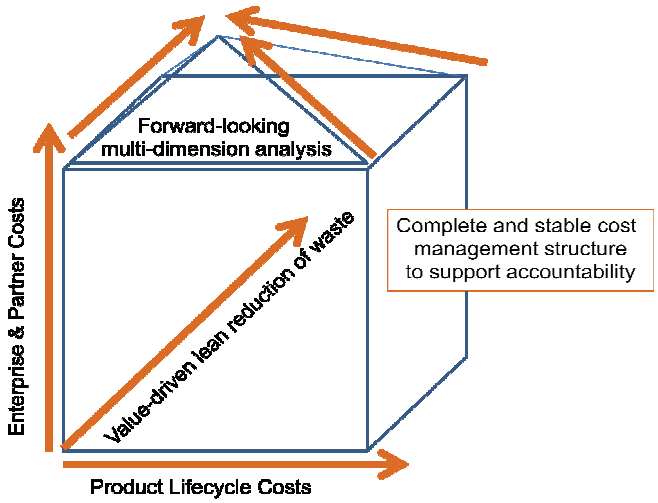


Figure 3: The aspects of winning cost management come together to enable accountability, and thus greater control and likelihood of success in sustaining competitive costs.

This comprehensive, proactive, and pervasive cost management is the foundation that allows executives to expect every manager and employee involved to make decisions in a larger context. (See Figure 3.) At that stage, a company can appropriately assign cost accountability and measure results in an unbiased way.

So the synergies are clear. Yet, adopting all of these aspects to have a winning approach to cost management is likely to be completely overwhelming without adequate IT support.

IT support for effective cost management

The five elements in Figure 3 clearly show that cost management is not a separate domain for cost accountants or operations managers nor the design team, but a shared responsibility across departments and across trading partners. The cooperative processes are evolving, but fortunately, there are software applications also emerging to support this transformation of cost management processes.

Clearly, cost management in the "new normal" has become an enterprise-level practice. We expect that an array of enterprise applications will contribute to this effective approach to cost management. ERP, SCM, CRM, PLM and MES/MOM will all hold significant cost data required for effective views, collaboration, and analysis. However, this transformation does suggest a set of core requirements to support proactive cost management.

- **Early lifecycle:** Capturing data from the start of the product lifecycle matches when costs begin to be locked up early in concept, design, and portfolio management. This is long before a product and all of the materials, suppliers, and specifications are ready to maintain in an inventory-oriented system.
- **Rationale for decisions:** Costs spring from the product and process design, which is generally the domain of technical applications. These applications hold the reasons behind engineering decisions, which are essential inputs for cost management.

- **Actual, future, and potential products:** The system must manage information about the full portfolio of products: not only about the products and services a company actually has to sell, but also future products and theoretical products. Future products need to be considered for costs, but also strategy alignment and expected margins. Products that will not be built may also provide critical insights into cost or other trade-offs during analysis and design. The system should provide key financial metrics to evaluate products and the entire portfolio.
- **Enterprise and multi-partner collaboration:** The system must easily reconcile incompatible views of data among departments and partners in a timely fashion. Further, the system must deliver strong, secure support for collaboration and interaction among trading partners, particularly for sensitive design and graphical intellectual property (IP) prior to and during the order-to-delivery cycle.
- **Format agnostic:** Manage a variety of source data types, including structured and unstructured data, graphical and relational data, representing a wide variety of disciplines.
- **Forward-looking analytics:** Rather than working exclusively against a data warehouse of transaction history, the system must have forward-looking scenario analytics to manage costs in a comprehensive way.

Product lifecycle management (PLM) can address all of these issues and more. PLM's support for multi-disciplinary collaborative processes enables cost analysis throughout the lifecycle and across the product portfolio. One of its critical strengths for cost management is the ability to analyze costs during the concept stage, before costs are committed.

PLM Cost Capabilities

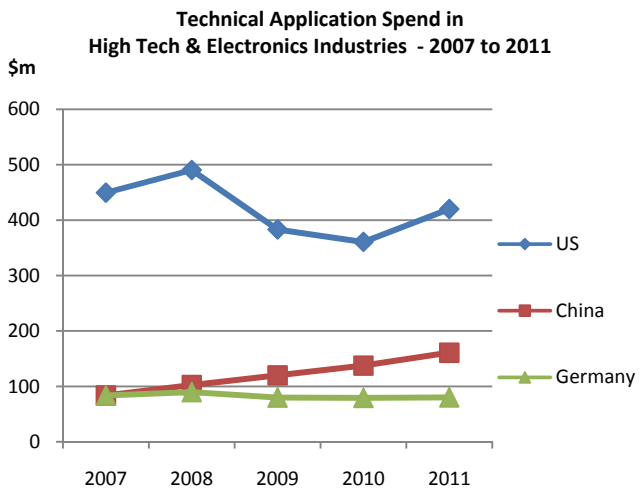
If PLM originates in engineering, not finance, how can it support cost management? Actually, PLM excels at comprehensive, proactive, pervasive, and continuous processes such as the new cost management. Cambashi defines PLM as systems that support the management of a portfolio of products, processes and services from initial concept, through design, launch, production and use to final disposal.

This type of multi-module solution is based on a robust data management platform capable of handling information not only from various engineering domains (mechanical, electrical, software), but also in various forms. These include graphical, unstructured, and structured data that can represent not only suppliers, supplied items and costs but also technical, graphical, and design intent. This depth and breadth, together with the integration of technical and other product and process information, makes PLM likely to be an effective platform for cost management initiatives and processes.

PLM has a both a forward-looking focus for concepts and scenarios and a repository for analyzing historical products and processes. PLM can also relate costs to these elements and help provide insight into both local cost drivers, and the way these relate to overall costs. PLM is a significant portion of the large technical applications market. Figure 4 shows a view of past and projected spending in the US, Germany, and China.

For manufacturers, many key cost management initiatives are intrinsically connected to specific details of products. For example:

- A 'squarer' product shape may enable closer packing, and thus reduced distribution costs.
- Conforming to local regulations and standards may involve postponement, or a deferred manufacturing step to adapt a platform product. To open up the cost saving possibilities of a standard product, engineers may be able to design automated localization. For example, the product might read a bar code when it powers up and adapt based on that.
- Procurement and manufacturing people may recognise the value of extensive lists of alternate components, but it is design engineers that must ensure the alternates don't compromise the finished product specification.



NOTE: value of 0.74258 for converting EUR to USD

Source: *Cambashi Country Observatory*

Figure 4: The *Cambashi Country Observatory* shows that technical applications expenditures have been growing dramatically in China, and were growing rapidly until the 2008-2009 economic crash in the US and Germany as well.

R&D cost management – Clearly, product and overall operations costs are largely determined during product conception and design. PLM not only manages CAD, CAE and software design data, it includes capabilities to manage the R&D process for both products and portfolios. This includes what-if scenarios to analyze trade-offs in portfolio mix or R&D budget decisions, and can enable capture and communication of know-how. PLM also provides robust program management to maximize the value-add of highly skilled engineering human resources.

Feature & requirements management – PLM today can also support value engineering, to ensure that market requirements are prioritized by what customers will value. Current PLM systems can support this effort and find, correlate, and use product requirements gathered in unstructured document format.

Design for low cost – PLM provides the core capabilities for creating and hitting product cost targets. Through cost roll-ups and analysis during the design process, PLM provides a sound basis for understanding the long-term costs a particular product will incur. PLM can also deliver digital prototyping, to eliminate costly physical prototypes and ensure higher first-pass yield on early run products. PLM can fully support platform strategies as well as parts and sub-assembly standardization and reuse. Finally, PLM is designed to accelerate multi-discipline activities such as DFM, SFSC, DFSS, etc.

Direct cost management – By delivering supplier and multi-level cost analytics across an enterprise or operating division, PLM allows companies to gain purchasing leverage that makes a difference not

on one part, but on the entire product and portfolio of products. PLM can provide not only data, but analysis and workflow process support for commonization and reuse. This capability applies to materials, components, parts, and subassemblies, plus product platforms, and, in more advanced cases, the rules and processes that provide the foundation for certain design activities.

Lean & Lifecycle focused development – Eliminating waste is core to managing costs, and PLM provides support in multiple ways. At core is the support for cooperation, visibility and unambiguous communication among many groups of people, both from different disciplines inside the company and from the industry network of suppliers and outsourcing partners.

Issue by Stage	PLM-enabled Approach
Meet market need	Value engineering with customer requirements capture & management
R&D cost control	Speed to access and collaborate with program/resource management and reduce physical prototyping
Total product cost	Target costing, with cost visibility and analysis through multi-level BOM
Portfolio costs	Multi-level scenario what-if analysis, business case development, and resource constraints analysis
Procurement	Product cost data per part & supplier; spend analysis across portfolio; supplier capabilities view & collaboration
Production	Concurrent engineering, DFM, DFSS, process design & simulation; faster ramp to volume with minimal prototypes
Outsourcing	Partner visibility, collaboration & capabilities plus IP security
Distribution	DFSC with packaging, warehouse, logistics capabilities in model
Information	Full product genealogy from materials to shipped product in single data repository
Warranty & Service	As-shipped and as-configured tracking; repair documentation
Recycling & Disposal	DFE to help meet environmental requirements, materials selected for compliance & recycle ease
Continuous cross-discipline lifecycle views	Single information system for entire lifecycle, including rationale & analysis plus workflows to direct interaction

Figure 5: Winning cost management addresses each stage of the product lifecycle and the interactions between them in a holistic fashion.

Figure 5 describes an approach to each departmental issue and to continuous cross-discipline views that can be achieved today through PLM. Note that this requires companies to use PLM not simply as a data repository, but as a mechanism to drive effective processes. Through all of these capabilities there are a few common PLM characteristics that matter to an effective cost management program:

- Ability to manage all types of data relating to a product, from graphical CAD data to specifications, to historical transactions, to unstructured market input
- Forward-looking cost analytics including what-if scenario analysis
- Effective and detailed multi-level views to balance costs not only within the BOM, but across products in a portfolio
- Visibility, interaction, and workflow among multiple departments and partners

Transforming cost management for sustainable margins

Cost management is critical to high tech companies' profit margins. Challenges of less predictable revenue and higher costs for compliance in "the new normal" demand a fresh approach to cost management. We have suggested five approaches that companies must adopt to succeed in keeping costs appropriately low. These are:

1. Information-rich industry network cooperation to get suppliers, outsource partners, distributors, OEMs and others working together for mutual success.
2. Full lifecycle cost management, beginning with the final costs in mind, factoring in service and disposal, and closing cost information loops at every stage.
3. Demand-driven, lean practices to ensure customer value is the starting point and the yardstick for waste in crafting product and portfolio strategies.
4. Proactive cost analytics to ensure that costs rarely arise as surprises, but were predicted and considered in the context of the full enterprise, industry network, product and portfolio lifecycle, to minimize waste and maximize value.
5. Enterprise-wide cost and spend management for a comprehensive multi-department approach that can make the right strategic trade-offs.

Making these five aspects an integral part of how the company does business may well differentiate the market winners. For most companies, this will be a transformation in their cost management practices. Rather than a narrow view of costs in one area, companies must take a broad and comprehensive view so that accurate cost assumptions are always in play for product and business decisions.

As described above, PLM has excellent capabilities to support cost management in becoming comprehensive, proactive, pervasive, and continuous. It is focused on the full product lifecycle and product portfolio. PLM can collect, put in context, and analyze all relevant cost data in any format. PLM's truly collaborative and end-to-end process management capabilities are an excellent foundation for cost management transformation. With everyone leveraging consistent data, the company culture of cost management can succeed in its mission of lowering costs.

As volatility and regulations march forward, Moore's Law need to be combined with intelligent cost management for electronics companies to thrive. Used together with sound IT application support, the five approaches create a more meaningful context for evaluating tradeoffs. Through this lens, individual cost decisions are more likely to align with objectives for company differentiation and financial performance.

About Cambashi

Cambashi, based in Cambridge UK and Cummaquid MA, provides independent research and analysis of the business reasons to use of IT in industry world-wide. Its specialist fields include Engineering, Enterprise, Plant, and Supply Chain applications and the infrastructure to enable industrial firms to use IT effectively. Cambashi publishes market size estimates in the Engineering Applications Market Observatory and multi-client studies in Cambashi's Industry Directions. Its clients vary in size from small to large and include most of the leading software vendors and many pioneering IT users. Cambashi is a member of CATN, an international association of consultants. www.cambashi.com

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Siemens PLM Software, a business unit of the Siemens Industry Automation Division, is a leading global provider of product lifecycle management (PLM) software and services with 5.5 million licensed seats and 51,000 customers worldwide. Headquartered in Plano, Texas, Siemens PLM Software's open enterprise solutions enable a world where organizations and their partners collaborate through Global Innovation Networks to deliver world-class products and services. For more information on Siemens PLM Software products and services, visit www.siemens.com/plm. For specific information on high tech industry offerings, visit http://www.siemens.com/plm/hightech.

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