TECHNOLOGY FORECASTERS INC.

Global Consulting and Research for Outsourcing and the Environment

Response Management for the Next Wave of Outsourced Manufacturing

Technology Forecasters projects the global market for electronic equipment to grow at a 6.3% percent composite annual growth rate (CAGR) over the next five years; we project the EMS industry will continue its penetration of the overall electronics total available market (TAM) at a rate that is twice the growth rate of the TAM worldwide. This penetration rate varies widely among different end market sectors, however. In the computer and telecommunications sector, the penetration rate is high—nearly 20% and 30% respectively. In other sectors, such as medical, industrial, aerospace/defense and instrumentation, the penetration rates are much lower—all under 10%.

Why the disparity?

Telecommunications and computer products are classified as 'high volume/low mix.' These products represent the first wave of outsourcing. The far-flung global supply chains that are currently providing consumers with these products are complex and fraught with risk and uncertainty. While burgeoning global consumer markets have ensured continuing growth for manufacturers of these popular products, top-line growth does not always mean financial success. The razor-thin margins, demand volatility, and increased global competition make each new electronic product introduction a risk-laden adventure. One year, a company may introduce a successful product that captures record-breaking market share; the next, the board of directors is calling for the resignation of the CEO. Product recalls, quality issues, and counterfeit threats—these are some of the painful realities that keep global electronics manufacturing operations and supply chain executives of consumer electronics up at night.

Supply chain disruptions are a way of life for many companies that have made the decision to outsource their manufacturing to factories located in geographic regions where labor costs are low. Furthermore, the old methods for compensating for supply chain disruptions—with inventory buffers and forecast speculation—are being eliminated by process improvement initiatives and profitability pressures.

As the outsourcing model gains traction in other market sectors, an increasing number of companies are also testing these waters to leverage core competencies of their own teams and those of contract manufacturers; to save money and to gain access to global markets. Technology Forecasters tracks emerging trends that will impact the global outsourced environment: the penetration of electronics and concurrently the outsourcing of manufacturing into new market sectors, e.g. medical devices, gaming equipment, automotive applications, and so forth; and the expansion of outsourcing services offerings into new areas of the product lifecycle, e.g. design, warranty and returns, and logistics. (See figure 1) These two trends mean that new players are embarking on the outsourcing adventure, and the supply network is lengthening and becoming more complex, requiring process alignment between an increasing number of suppliers and new tools and techniques for sharing information across corporate boundaries.

The hallmark of electronics used for products like medical devices, gaming equipment and security systems is the fact that these products are not produced in large quantities, can have thousands of part numbers (PN) and are highly configurable, with frequent changes. In other words, they are low volume/high mix (LV/HM). Charlie Barnhart, TFI Senior Consultant, identifies three implications of these realities:

- LV/HM is typical in commercial products where electronics represent a minority value of the Total Cost of Goods of the end unit
- LV/HM is typical in highly configurable products with a high number of assembly SKU permutations
- LV/HM is inherently more difficult to plan, support and manufacture than High Volume/Low Mix

LV/HM Poster Child: Medical Device Electronics

The number of senior citizens is predicted to double by the year 2015, and expectations regarding health of this aging population are high. This represents an opportunity for the electronics industry, as Craig Barrett, CEO of Intel noted in his keynote address to the White House Conference on Aging. “This is a golden moment to bring government, health care professionals, industry and academia together to accelerate innovation and investment for this critical issue. No company, no industry, no country can afford to ignore the economic and social impact this wave of aging people will create.”

One of the greatest challenges in the medical electronics field is obtaining regulatory approval. It can takes up to six years to get a new medical electronic product to market. Once a device gets the approval from regulators, manufacturers must persuade doctors and insurers of its efficacy to gain widespread use—they must provide evidence that it will have a positive impact on health care. Gaining approval and providing such evidence is a key piece of the new-product development cycle in medical electronics. These activities create substantial levels of uncertainty and risk in the extended supply chain: if a product is successful, ramp-up must be swift to take advantage of market opportunities.

It takes time to establish relationships with contract manufacturers. Some OEMs, especially those that are new to outsourcing, do not yet have a history from which to calculate the total costs—both internal and external—of electronics manufacturing in remote geographies. OEMs that are accustomed to access to informal ‘tribal knowledge’ about their manufacturing process from within their own organizations, including the ability to react to unforeseen events, are finding it difficult to adjust to the lack of visibility into contract manufacturers’ inventory levels and manufacturing processes.

As global competition heats up, and more market sectors outsource electronics manufacturing, a few rocks in the extended supply chain are being turned over, revealing some glaring inefficiencies and opportunities for improvement. In particular, the use of a planning model based on forecasts led to the inventory melt-down in the early part of the decade in the high-volume telecommunications sector. Using a forecast planning model for even more challenging low volume/high mix products will lead to similar bad results. Companies that intend to stay competitive in all market sectors are learning they must develop radically more responsive and adaptive supply networks to manage risk and improve profitability. They are developing a model whereby decision-makers gain visibility into synchronized data in real-time and across the extended supply network. This visibility gives them the ability to respond to demand/supply misalignments before disruptions occur.

Response Management for Next Wave of Outsourcing

Using a web-based application that provides visibility in real-time can help leap-frog the learning curve for these new relationships and ensure profitability from the beginning of the product lifecycle. Response Management techniques can be built into the extended supply chain to proactively manage inventory and supply exposure. This can be especially helpful for medical device OEMs during the regulatory approval and production ramp up stage. Response Management allows front-line decision-makers to proactively manage inventory and supply exposure, and material costs:

- Integrate view of inventory at the Finished Goods, Outsourced Part and Critical Component level
- Manage inventory to targets
- Identify excess inventory based on total demand and supply
- Leverage existing inventory by identifying opportunities for inventory moves to cover shortages elsewhere
- Manage engineering changes, new product introductions and product end-of-life to minimize excess and obsolescence
- Support information for component life-time buy analysis
- Assess potential liability associated with the current or proposed demand and supply plans which will reduce liability claims and improve margins.
- Gain a single, integrated view of liability across the brand owner and contract manufacturer supply network

Response Management's integrated view of component requirements and total spend across supply network also facilitates improved price negotiation and supply base reduction opportunities. The Bill of Material (BOM) analysis supports lead time reduction and potential product redesign opportunities. For example, users can take advantage of the time-phased view of BOM cost build-up to support efforts to delay materials costs, which improves overall profitability.

Broadening the Model: Implications for Manufacturers

Companies are extending the outsourced model at both ends of the product lifecycle, e.g. design on the front end and logistics, warranty and returns on the other. TFI Senior Consultant Charles Wade tracks OEM outsourcing activities, and has noted a trend of outsourcing design activities, post production distribution, and after-market services. Weighted by OEM revenue, the companies in his study indicated they currently outsource 14 percent of their design scope, on average, as compared to 42 percent of their PCB layout activities; for other pre-production activities the average indicates almost two-thirds of this activity is currently outsourced. Wade further notes that PCB assemblies may have reached a near saturation point for the OEMs he tracks; currently these organizations outsource circuit board assembly 72 percent of the time; box-build and sub-assembly at a rate of 62 percent. Currently 40 percent of their current shipping to the end customer or distribution is handled by EMS providers. This area represents a major opportunity for EMS revenue growth. Also, the after market repair and refurbishment business offers growth potential.

Adding vendors to a broader range of business process activities adds complexity and challenges to information system collaboration. Design chain and logistics activities are complex activities, requiring expertise at all levels. Responsiveness is key to success for both OEMs and EMS organizations: everyone in the 'value chain' needs to be responsive to change. By definition, the more complex and volatile the extended enterprise, the more tradeoffs and course corrections will be required to stay on track. That means that those on the front lines making decisions must be empowered with accurate information. The supply chain is only as strong as its weakest link.

The outsourced electronics manufacturing supply chain is lengthening, and information systems are increasingly complex. While satisfaction with supply chain solutions is high, integration continues to be a challenge, according to a recent TFI survey of OEMs and EMS software solution users. TFI suggests adding two additional business process categories to the traditional SCOR model's Plan, Source, Make, Deliver, Return/Support -- Design and Sell. Combined, these seven process categories (Design, Plan, Source, Make, Sell, Deliver, and Return/Support) complete the business processes that are required to meet customer demand. At a broad level, these seven processes constitute the definition of supply chain. Often these processes are referred to as the supply and demand chain.

Beyond the Planning Model to Response Management

Traditional demand and supply chain planning solutions designed for cycles in weeks, months and quarters and used by a small number of highly skilled planners were not designed to explore action alternatives rapidly. Lacking multi-enterprise data visibility, these solutions do not offer the real-time collaborative environment needed to deliver the optimal response.

Unlike the centralized planning processes, Response Management must be very distributed — calling on front-line decision makers throughout the entire fulfillment network and supply chain to contribute to a rapid and accurate response. In the midst of constant change, 'black box' optimization no longer works. Leveraging human capital and the insights they uniquely have into the business, its customers, products, etc. is the key to rapid and effective response. Frequently, people need to collaborate with colleagues and partners around the world, drawing on unique insights each contributor has to address a given problem. To achieve this, people need to be empowered with visibility and tools to simulate what is possible and what the impact of their actions would be on metrics critical to the business. Visibility on its own is ineffective without the analytical decision support required to make the right decisions at the right time to avoid disruptions. An automated, exception-driven approach that allows a comparison of alternatives against a set of key metrics provides the tools needed for these next generation, complex global supply networks.

With multi-enterprise visibility, front-line decision makers can quickly collaborate to reach optimal decisions that not only align with corporate objectives, but rapidly drive effective action. The effectiveness of these decisions and actions often determines customer satisfaction and retention, and even business profitability or margin loss.

Response Management provides global visibility to actionable data, as well as the ability to rapidly and collaboratively assess many 'what-if' alternatives. The Response Management approach includes a comprehensive scoring mechanism to accurately predict the impact of a response and weigh alternatives against company goals and customers requirements so the best option can be identified. The Response Management solution goes beyond traditional historic scorecarding and performance metrics because it is a web-based approach that allows access to real-time data for multiple users across the extended enterprise. It automates and expedites the decision-making process to reveal the impact of proposed actions before they are made. This technology is distributed to empower the users who need it up and down the supply-chain. Almost instantaneous ROI quickly justifies the decision to implement. In TFI research surveys, OEM and EMS providers give the Kinaxis solution the highest marks for overall satisfaction.

Broadened Product Lifecycle Support at Venture Corporation Limited

Venture Corporation Limited, one of the world's largest Electronic Manufacturing Service (EMS) providers, has chosen to deploy Kinaxis ***Rapid****Response*, a Response Management solution, at each of its seven manufacturing sites, and has completed the first implementation at its Johor Bahru, Malaysia location.

With sales of S$3.2 billion (US$2 billion) and Fortune 500 customers including Hewlett Packard, IBM and Agilent among others, Venture ranks high in managing the value-chains of leading electronics companies, offering a full-range of design, manufacturing, testing and fulfillment services. To maintain and improve upon its progressive operating environment—a distinguishing factor for the organization within the competitive EMS arena—Venture will employ ***Rapid****Response* to increase its speed and effectiveness in meeting constant supply, demand, capacity and product changes.

Rapid*Response* will allow Venture to enhance its business simulation and response capabilities, reducing reaction time from days to hours. Impact analysis and/or simulation of changes, in particular customer order changes, can take highly trained specialists over a day to perform using traditional ERP and supply chain planning tools. By leveraging real-time data pulled directly from Venture's ERP system, ***Rapid****Response* modeling capabilities will allow those supply chain participants dealing directly with the issue at hand to instantly and independently develop, share and simulate countless "what-if" alternatives to evaluate the impact of proposed changes and ultimately drive quick, effective resolution.

The flexibility of ***Rapid****Response* in integrating data from various sources and different formats to present it as a single aggregated view, will enable global visibility among different plants, product groups, projects and functions; therefore offering comprehensive information on which to base decisions. When faced with a change, front-line staff can quickly determine a reliable action plan that best meets customer requirements as well as internal operations performance objectives.

Kinaxis' streamlined deployment process and proven expertise and experience with ERP integration reinforced the proposition of a short, low-risk implementation. With the initial deployment in Malaysia now complete, Venture anticipates realizing a very attractive time-to-value cycle. And the value received, particularly from a global visibility and multi-enterprise management perspective, will deepen as it progresses with its multi-site implementation plans, likely to be completed in nine months.

The Teradyne LV/HM Challenge

Teradyne operates in a complex and volatile market typified by the low-volume high mix product set. Teradyne's products comprise 3,000 - 5,000 parts each. As Teradyne seeks cost savings through outsourcing relationships, new complexities are introduced into their global supply chain which now spans five Teradyne and four subcontractor sites. Particularly, long lead-times that can hamper responsiveness to change are a constant challenge. One of the most significant challenges is the transmission of frequent demand changes and the inability to lock in the supply with "frozen" demand windows. Outsourcing creates new challenges in terms of inventory liability and managing excess and obsolete inventory as well.

In addition to an increasingly complex supply chain, Teradyne faces significant demand fluctuations. The market has seen significant upswings during good times, while customers are quick to "slam on the brakes" in soft markets. It is not uncommon to see a product's shipments double in one quarter and be cut in half over sequential quarters.

Teradyne came to the conclusion that they required a solution with global visibility and rapid response capabilities in order to manage changes in demand, understand supply consumption and how to manage supply disruptions, shorten lead times and reduce excess and obsolete inventory.

Teradyne found that Kinaxis ***Rapid****Response*, a Response Management solution, had the unique architecture to integrate not only with their Oracle ERP system but also with the ERP systems of their contract manufacturers while enhancing their responsiveness.

For example, ***Rapid****Response* is used to determine how to manage part suppliers when parts are purchased by Teradyne or subcontractors. And, when Teradyne wants to send more product to a subcontractor, ***Rapid****Response* is used to get a detailed list of parts and inventory to be transferred. Teradyne staff utilizes ***Rapid****Response* what-if capabilities to compare various action alternatives to determine the best course of action for a given change.

Teradyne planners, inventory managers, commodity managers and others utilize ***Rapid****Response* to view data across their extended supply chain and to create enabling tools to manage constantly changing business processes and business situations. ***Rapid****Response* is a critical tool enabling Teradyne to execute the reconfiguration of their supply chain to meet changing requirements.

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