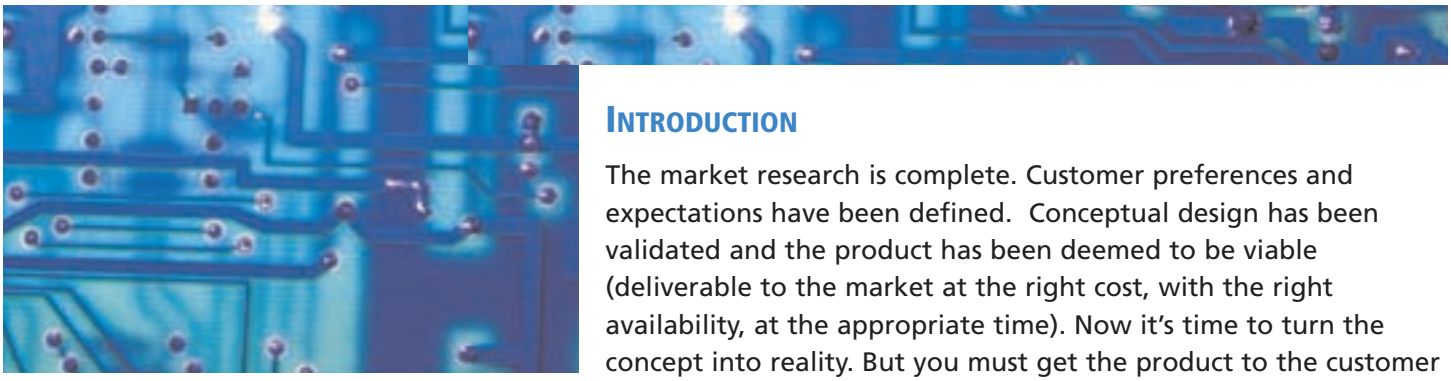
The EMS Provider's Critical Role in New Product Introduction

By Ed Evangelista

FEDERAL
ELECTRONICS



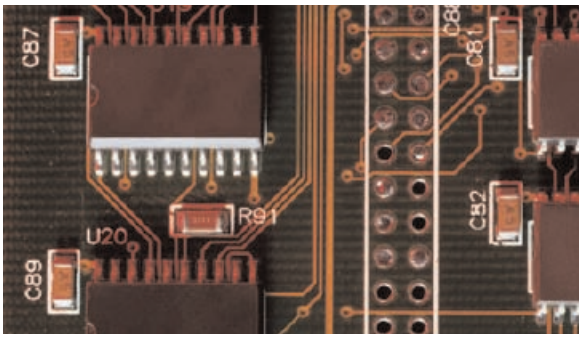
Introduction

The market research is complete. Customer preferences and expectations have been defined. Conceptual design has been validated and the product has been deemed to be viable (deliverable to the market at the right cost, with the right availability, at the appropriate time). Now it's time to turn the concept into reality. But you must get the product to the customer before a market inflection, such as the introduction of disruptive technology or a price war by a competitor, essentially obsoletes your new design before it ever hits the streets.

Original Equipment Manufacturers (OEMs) have always been challenged to bring viable products to market quickly and efficiently. As product life cycles continue to decrease and global competition heats up, that challenge has become more daunting. Expectations for shorter development cycle times continue to increase, yet internal resources are thin from a seemingly never ending series of corporate realignments and reorganizations. This trend toward "rightsizing", coupled with the fact that New Product Introduction (NPI) tends to happen in "spurts", further taxes an already lean infrastructure. And it's not just design engineering that's affected. Material acquisition and manufacturing are equally affected, especially if the new product requires the introduction of new suppliers and/or new manufacturing processes.

It is a rare instance today when an OEM "goes it alone". There are many options available that can provide relief in virtually every aspect of NPI. If the use of an electronic manufacturing services (EMS) provider to assist in the development process is part of your NPI strategy, then this whitepaper is for you. Defining the role of outsourcing within your NPI strategy and selecting the right EMS provider to execute that strategy will go a long way towards minimizing the chaos and turmoil associated with the product realization phase of your development process.

This white paper's scope is to identify the generic stages of a typical NPI project and demonstrate how an EMS provider might be utilized to facilitate a more efficient and cost effective process. But prior to discussing those stages, it is important to understand the entry point for your EMS provider. Historically, new product designs were developed by internal engineering groups with little or no contribution from operations (materials, manufacturing, quality, etc.). In response to competitive pressures, which dictate lower cost, higher quality, and shorter cycle times, today's NPI activities typically include an operational component as well. This approach incorporates best practices in product design, materials acquisition and pipeline strategy, and manufacturability at the earliest stages of the NPI process. These combined efforts produce better, more reliable and more competitive designs with minimal hiccups as manufacturing ramps to production levels.



NPI: The Best Entry Point

So what's the best point of entry for your EMS provider? It depends upon your design strategy. You can find a contract manufacturer (CM) for practically any scenario. If you intend on keeping all of the design work in-house, your initial engagement with a supplier might be at the prototype stage. I know of many OEMs who keep a list of small, local, commodity specific CMs who are willing to work on a consignment basis and can turn product in one week or less. If you are intent on outsourcing at a higher level of assembly and are inclined to look towards an EMS provider for assistance with component selection, cost containment, and DFMA analysis, then you would be well served to identify an EMS partner who has the requisite knowledge and skills and engage them at the earliest stages of product development.

In short, a CM's point of entry is dictated by your willingness to incorporate their skills into your design process. There is no right answer, only the answer that works best for you. For purposes of our discussion, I will assume that entry into the NPI process prior to the prototype stage implies a multi-faceted engagement plan, incorporating topics such as those listed above.

The following is a description of the stages for a typical NPI project after the concept has been developed by the OEM's marketing and engineering functions. Opportunities for EMS provider engagement are listed for each.

Stage 1: Project Kickoff

In my experience, the typical NPI project is long on urgency and short on details. It is also a very complex process, requiring the coordination of cross-functional efforts with critical deadlines at a time when change is most prevalent. When one considers the introduction of outside services, either design and/or manufacturing, it is easy to see how many projects become studies in crisis management.

The most successful projects I have personally participated in were the result of careful planning, a thorough and accurate dissemination of information from the OEM to the supplier at the earliest stages of engagement, and a feedback loop from the supplier that is capable of communicating real-time (or as close to real-time as possible) information through the appropriate channels so immediate action can be taken to correct misalignments. From an EMS provider's vantage point, there are three critical elements for project success: the creation of effective teams, a reporting format that will communicate any issues that result in schedule misalignment, and a full understanding of expected deliverables.

EMS Team Staffing

The key to team staffing on the EMS provider's side begins with a dedicated program manager with the requisite skills to successfully navigate the particular challenges of the project at hand. I have seen instances where anyone but a full-fledged engineer in this position would have met with certain failure. In other projects, the nature of the customer's team, and the preponderance of administrative and logistics issues,

warranted a program manager on our end who had more business experience. In this case, the project leader manages pipeline issues and ECO status and reporting with his business-oriented counterpart on the customer's team, while engineers on both sides hash out the technical details. In addition, it is becoming more customary for the EMS team to include supply chain and quality staff as well. As OEMs drive cost reduction efforts, lean initiatives, and product flexibility into the design cycle, cross-functional teams are becoming more the norm.

Reporting Format and Frequency

In new product development, change is a certainty. It is the extent and the timing of the change that can be crippling, especially if there is no leeway in the project due date. The challenge becomes capturing the effects of the change, identifying misalignments in areas such as schedule or cost, and communicating the causes of those misalignments to both OEM and supplier management for appropriate and timely action. Reporting format and frequency are critical to maintaining schedule compliance. An EMS provider should be expected to provide updates, on at least a weekly basis (more frequently depending upon the progress of the project), with the following topics:

- Material and tooling availability, including vendor names, purchase orders, points of contact and current delivery dates for all items that violate schedule compliance
- Ongoing analysis of costs as changes to material and process are implemented. Cost increases beyond the program budget would quickly be highlighted and communicated to management, including an assessment of the root cause and suggestions for correction, if such a correction is within the purview of the EMS provider.
- Review of all open technical issues, with assigned control numbers for ease of tracking

Reports should be compiled and submitted at least one day in advance of a scheduled status meeting so that the OEM has the time to align resources accordingly.

Project Deliverables

When NPI strictly referred to engineering design activity, project deliverables typically consisted of product specifications and performance parameters. As the scope of NPI projects expands beyond technical specifications, it is vital that project deliverables (or milestones) accurately reflect these expectations, and that they be effectively communicated, tracked, and measured, especially when an EMS supplier becomes part of the process. Creation of critical milestones and expected completion dates is a critical component to the successful management of an NPI process. Too often, suppliers are not aware of their role within the development process. They receive quotes, which in turn become Purchase Orders, with product needed immediately. There is no provision for the supplier to plan appropriately; to soft allocate resources throughout its operation so that when the product specifications, quotation, PO, etc. are received, they can execute with a reasonable level of certainty that the expectations will be met. Lack of information causes an inefficient deployment of resources on the supplier's side, which can fuel a larger misalignment down the line. By defining and sizing the appropriate milestones, management can also insure that project progress is communicated with maximum

effectiveness and minimal waste. Each milestone provides management with the opportunity to abandon, change, accelerate, or simply approve the project at that particular point.

Non-Technical Objectives

Typical non-technical project objectives are listed below, and while it certainly is not exhaustive, it does provide a flavor for the types of considerations that more frequently find their way into design and development activities.

- *Cost constraints:* I'm not aware of any NPI projects where the OEM hasn't firmly established the cost points it must achieve in order to pave the way for market acceptance. But I am amazed as to the number of times that this information never finds its way to the suppliers. Providing cost objectives, such as maximum allowable cost for the raw material or for raw material transformed into what ever level of product you outsource, places the onus on the supplier to work with you towards a successful conclusion.
- *Product availability:* Too often, OEMs focus design efforts on the technical aspects of the product with little or no thought to product availability once it is released to market. Elements such as raw material lead-time or single sourcing of critical components can wreak havoc on manufacturing's attempt to respond to upswings in demand cycles. It also results in extended liabilities for these long-lead or single-source parts to insure that a viable material pipeline is available to address volume variability. By virtue of their involvement with different customers and different industries, EMS providers can be a great source of information when it comes to the selection of raw material with an eye towards availability and multiple approved sources.
- *Process design validation:* At a minimum, an EMS provider should be selected for its ability to manage a material pipeline and transform that material into what ever level of product you desire - assuming compliance with the appropriate industry and/or workmanship standards. An important objective of any NPI project should be the validation of the processes used to create the product, resulting in feedback that is incorporated in the design stage to maximize manufacturability and yields.
- *Product design validation:* Not as prevalent as process design validation, but depending upon the extent of your relationship with the EMS provider, it is a point of consideration.
- *Supply chain strategy:* This objective consolidates all of the material and supplier selection issues listed above and creates a snapshot that helps to determine supply chain risk factors (sole sourcing, domestic verses offshore production, logistics, etc.). If data is collected and analyzed properly, it also allows for an accurate depiction of raw material pipeline flexibility as well as the financial liability associated with funding the pipeline to support expected demand plus a calculated potential upside. I have seen many customers utilize this exercise to expand the flexibility of the pipeline while at the same time minimizing their liability.

Stage 2: Product Development

A viable concept has been established and it is time to turn the concept into reality. Engineering leads development efforts to transform the technology into a marketable solution. An EMS provider's role in this stage becomes more prevalent as the design starts to take shape in the form of preliminary documentation. While the supplier may not directly contribute to the technical aspects of product design, it can certainly provide value in terms of accurate costing, supply chain strategy and DFx initiatives.

For example many companies believe that if they provide their prospective suppliers with adequate product documentation (Bills of Material, product specs, etc.) and an annual run rate, they have created an even playing field that will allow for an accurate assessment of each supplier's competitiveness. This couldn't be further from the truth. The more information that is provided at this stage of the process, the better. Notwithstanding the obvious as listed above, consider the benefits of providing the following:

- *Cost targets:* This was touched upon earlier, but setting and communicating cost expectations at the outset of the project is an effective tool to not only contain costs, but also to shorten the quote cycle time (quotes submitted, target not achieved, feedback provided to suppliers, quotes resubmitted, etc.).
- *Material (BOM) review:* Many EMS providers may be able to introduce alternate suppliers for raw material that may reduce costs, shorten lead times, and even eliminate an extremely risky sole-source/directed-source scenario. A BOM review would also expose raw material items whose pricing varies significantly with volume. Understanding the quantity at which raw material price points become attractive may mean the difference between keeping the current design and initiating potentially unnecessary actions to find an alternate source.
- *Non-recurring engineering charges:* This includes assembly tooling, assembly and test fixtures (if applicable), and any other development costs. All charges should be itemized within the proposal.
- *Lot sizing:* In many instances, manufacturing lot sizes can have a major impact on product pricing. Identifying your consumption rate in terms of frequency and size of your expected delivery requests can be helpful. It also enables the EMS provider to implement a process that is most economical at those volumes.
- *Documentation scrubbing:* NPI documents are rarely pristine, and for obvious reasons. At this early stage, an EMS provider should be expected to identify, in writing, any issues that prevent the completion of the quotation to the specifications, including obsolete or incomplete component supplier part numbers, missing approved vendor list for a particular part, or missing/ incomplete information. This is the first stage of the supplier documentation control process. Assumptions must be limited as much as possible and must be appropriately documented by the supplier in writing if you are to conduct an "apples to apples" comparison between suppliers. The better your documentation package, the more valid and accurate the supplier proposals will be.
- *Preliminary DFMA:* Some suppliers have the ability to provide low-level DFMA analysis at the time of quotation. I mention low level because a thorough DFMA

analysis is time consuming (and expensive) and many suppliers hesitate to conduct such an exercise when the business has not yet been awarded. However, they also realize that such analysis might provide the basis for a cost reduction that would give them a competitive advantage. If you are open to design changes at this point (and the NPI process is the perfect time to introduce DFMA), then ask the supplier to quote both to the print as well as with their changes incorporated. If the changes produce a reasonable savings, you can then request more information to determine if the change is feasible from your perspective.

It should be noted that these same controls and mechanisms must be utilized throughout the NPI process as your EMS provider responds to engineering change orders so that you maintain a constant handle on product costs.

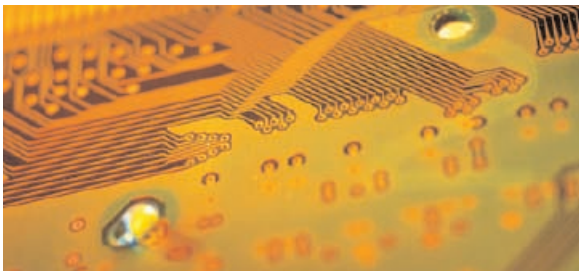
Stage 3: The Prototype

It's time to turn the concept into reality. Prototypes are needed to confirm form, fit, and function. An EMS provider should be fully engaged at this point, and prepared to provide design feedback as appropriate. Feedback areas include, but are not limited to the following:

- Confirmation of BOM and print accuracy
- Early-stage validation that the product design is manufacturable
- Form, fit and function meet expectations
- Preliminary test-out for DFMA
- Preliminary baseline established for a repeatable and controlled process
- Preliminary foundation established for functional test development

It is important to note that ALL product changes MUST BE DOCUMENTED IN WRITING, preferably tracked and monitored for closure.

The last phase of this stage is prototype review and approval. Once the product is submitted and the design has been approved, the consolidated list of modifications can be processed as one final engineering change order before release for production.



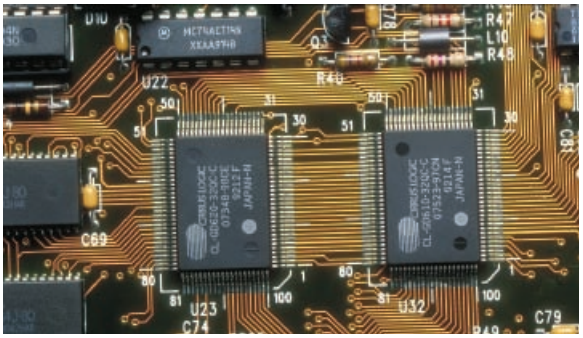
Stage 4: Pre-Production/Product-Process Verification

Product and design verification is complete. Final product configuration has been established and engineering change orders (ECOs) have been issued. In the Pre-Production/Product-Process Verification stage, preparations are made for full-scale production. From an EMS provider's standpoint, those preparations should include the following:

- Process remaining ECOs, comparing the ECO content against the original requests for deviation submitted during the earlier stages, insuring that all documentation is current and reflective of the final design.
- Verify BOM and review cost
- Finalize and release process documentation, including quality control plans

- Finalize plans for functional test, including fixturization
- Review supply chain issues, including preparation for contract pricing on cost drivers (if applicable), reconfirming lead-times and lot sizing
- Review production plan, including creation of work cells, capacity planning based upon forecasts, etc.

At the conclusion of this stage, the foundation has been laid for a smooth transition to sustaining manufacturing.



Summary

Market conditions dictate that OEMs introduce new products quickly and effectively. Qualified EMS providers possess the experience and skills necessary to complement this very complex process. The extent of their role will be largely dependent upon the OEM's design and outsourcing strategy, and their willingness to engage with suppliers as early in the process as possible. Selecting an EMS partner can mean the difference between a successful product launch and a product introduction nightmare. A capable EMS provider, operating within the context of a robust design and development program, can play a significant role in creating a sustainable competitive advantage for the OEM.

Mr. Evangelista is vice president at Federal Electronics Inc. He can be reached at 401-944-6200 or ed_evangelista@federalelec.com.

About Federal Electronics

Founded in 1948, Federal Electronics, Inc. is a leading electronics manufacturing services provider. Based in Cranston, Rhode Island, the company serves the needs of original equipment manufacturers and government contractors by providing comprehensive production solutions that lower cycle times, control and reduce costs, and create flexible supply chains that are responsive to volume variability. For more information, visit www.federalelec.com.

75 Stamp Farm Road, Cranston, RI 02921