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**Outsourcing and Efficiency: Understanding
the Project Disciplines Outsourcing Can
Drive Within Your Organization**

Outsourcing and Efficiency: Understanding the Project Disciplines Outsourcing Can Drive Within Your Organization

By Curtis Campbell

One of the biggest benefits of outsourcing is that it frees up capital and resources by making it possible for an original equipment manufacturer (OEM) to focus on core competencies and marketing. A good electronics manufacturing services (EMS) provider doesn't simply build products, they are experts at product manufacturing. One of the reasons for that expertise is that there is no room in most EMS companies' margins for inefficiency. When an OEM adopts an EMS provider's recommendations for process improvements that impact the outsourcing relationship, its internal efficiency may also improve. This element is important because while most OEMs measure costs at their EMS partner to the nth degree, they may not be measuring the cost of internal inefficiencies relative to engineering or supply management practices. SigmaTron International operates a global network of electronics manufacturing services (EMS) facilities and works with its customers to achieve efficiency throughout the product realization process. This whitepaper looks at four areas where EMS project disciplines can help drive improvement in OEM project disciplines. They are:

- Transition of work
- DFX
- Forecasting
- Understanding of total cost.

Transition of Work

Whether a new design or existing production, the transition of work process can be fraught with inefficiency and most EMS providers have formal process for dealing with it. What drives inefficiency on the OEM side of the equation? First and foremost, it is often that OEMs are focusing on core competencies and disengaged from the manufacturing process. Common issues include:

- Incorrect revision levels in some documentation
- Incomplete documentation (most often the first time a project is outsourced)
- Failure by a previous contract manufacturer to communicate to that customer the process tweaks that have been done to address design flaws
- Errors in documentation (such as incorrect component footprints).

The New Product Introduction (NPI) process is designed to address these potential issues. The NPI phase is the critical step in ensuring a smooth launch to volume production. This is the point where a transfer

of knowledge needs to take place in both directions. At the EMS provider level, all information needed to successfully build the product needs to be identified and transferred. The EMS provider needs to be able to identify any gaps in knowledge and pull that information from the appropriate source. On the flip side, lessons are typically learned in the first production run that are valuable to both the design team and the OEM. The EMS provider needs to have a good process for documenting that knowledge and sharing it with relevant members of the team in those organizations so that any needed improvements can be made.

At SigmaTron, the NPI process starts with the receipt of CAD files from the customer, along with the BOM and AVL. If DFX and product lifecycle management (PLM) activities have not been performed earlier in the process, they are performed during NPI.

Other issues that can potentially impact production cost are also evaluated as the process flow is designed. This focus on developing the most efficient process flow is particularly beneficial for highly regulated products, such as medical devices, where there may be limitations on process changes once the product is in production.

Once the process flow is approved, SigmaTron's use of leading edge software enables machine programming to be done using the CAD data. This cuts time and ensures accuracy.

Product and process validation is done based on customer requirements. Any issues discovered during NPI and pre-production runs are documented and provided to the customer. The end result is that defect opportunities are eliminated wherever possible, improving first pass yields and eliminating non-value added activity. Equally important, the process is designed to convey information in an easy-to-analyze and make decisions upon format.

This formalized process has a series of milestones associated with ensuring a smooth transfer of work. When OEM teams take the lessons learned about gaps in information during the transfer process and use it to improve their internal documentation development and transfer activities it can reduce the time internal teams spend in future transfers. Additionally, when this process is seen as a collaboration, the information shared by the EMS provider can often help the design team improve future product generations.

DFX

OEM engineering teams are typically focused on product fit, form and function. When an OEM outsources all manufacturing, it is easy for engineering teams to work in a silo that insulates them from the production consequences of the design decisions they make.

As experts in manufacturing, EMS providers routinely provide manufacturability and testability advice designed to eliminate the issues that create defect opportunities or added processing cost. They may also make recommendations on approved material list (AML) selections to minimize availability or obsolescence issues. Collectively, this review and recommendation process is referred to DFX.

In SigmaTron's business model, product development engineering assistance is available for new products, design for manufacturability and testability (DFM/DFT) recommendations are made when projects are started and continuing engineering support is available over the life of the product.

DFM analysis is performed using a combination of Valor and proprietary software tools. The documentation review process also uses a Valor parts library (VPL) to verify the footprint of all components specified in the BOM against the land patterns used in the layout. This helps eliminate both the opportunity for defects caused by manufacturability issues plus eliminates the non-value added time that can be spent reprogramming machines or re-spinning the printed circuit board layout if component packaging specified in BOM doesn't match the land patterns used in the layout.

SigmaTron can also perform PLM as part of its NPI process. Additionally, it has an experienced materials team that works closely with suppliers to identify potential availability and obsolescence issues as early as possible and recommend the most appropriate solution. The Company can also provide product redesign recommendations.

When OEM and EMS provider engineering teams set up a framework for collaboration in product development, a number of efficiencies are realized:

- Design iterations are reduced as DFX recommendations are incorporated earlier in the process
- Defect opportunities are reduced as a result of more manufacturable designs
- Test cost may be reduced if collaboration in the design process optimizes the product for test
- Obsolescence risk and availability issues can be reduced through collaboration on component choices
- Material liability may be reduced if a focus on component commonality is incorporated into design practices
- Overall time to market may be reduced when early collaboration eliminates surprises that otherwise cause delay in production ramp.

Forecasting

The quality of the OEM-EMS provider forecasting and communication process can have a significant impact on both project cost and responsiveness. The EMS process typically involves analyzing a customer forecast against historical demand and setting minimum/maximum material bonds within the supply chain. Kanbans or buffers may be set up at the printed circuit board assembly (PCBA) or finished goods levels to address variations in configure to order (CTO) products. Typically, OEMs give a rolling 12-month forecast and in times of significant material constraints, this may be extended to 18 months. Done correctly, this process helps ensure material availability with minimal liability. Companies who regularly utilize contract manufacturing generally have a good forecasting process, but personnel changes can sometimes create a learning curve. Companies new to outsourcing, especially when new products are involved, generally need to be coached in developing accurate forecasts. Collaborating with an EMS provider in this effort can result in a more disciplined approach to forecasting across all projects.

A telecommunications project in SigmaTron's Union City, CA facility provides a good example of how collaboration can improve responsiveness. This variable demand project involves 30 different product types and included some CTO options. To address that, the customer provides a blanket forecast which is reviewed by the EMS program manager and updated via a weekly review meeting. A finished goods Kanban has been set up that is sized to mutually agreed upon forecast numbers and replenished based on program management review of shipments. PCBAs are built and stocked in a supermarket arrangement to optimize the number of scheduled production runs at that level. Two products are built in a CTO scenario based on a 24-hour response window and the rest are built and stocked based on mutually agreed upon forecast numbers. This arrangement is flexible enough to provide the responsiveness the customer needs; yet disciplined enough to leverage EMS economies of scale and process efficiency.

SigmaTron's team also provides fulfillment services for the project. Shipping product directly from the factory to the end market eliminated a transport leg between SigmaTron and the OEM. The PCBAs are assembled into cases in a dedicated work cell. In all but two products, the team pulls products scheduled to ship from a drop ship finished goods Kanban that includes finished units and purchased accessories. The customer owns the finished goods inventory that is resident at SigmaTron.

As this example shows, collaboration has improved efficiency and identified options for saving cost through integrating fulfillment activities. Weekly review meetings help sanity check a highly variable forecast. Kanbans are used to smooth variations in demand.

Understanding of Total Cost

Outsourcing manufacturing is a complex transaction with both obvious and hidden cost drivers. There is no one perfect lowest total cost of ownership (TCO) solution. Factors that can change the cost equation include:

- Project maturity
- Special requirements
- Demand variation
- Margin sensitivity
- End market location.

One of the advantages of selecting an EMS provider with a global network of facilities is the ability to analyze the strategic value and total cost of various locations. Additionally, should product requirements or margin pressure dictate a change in strategy over time, the project can be transferred to an onshore, offshore or nearshore facility without the learning curve found in moving to a different EMS provider.

SigmaTron's manufacturing facility locations include U.S. locations near Silicon Valley and Chicago; three locations spread across Mexico; a facility in China; and a facility in Vietnam.

SigmaTron focuses on a scalable solution approach and offers customers the ability to build different product lines in different facilities when their requirements don't fit a single facility option. Forecasting and production layout are optimized for those projects. For example, SigmaTron's facility in Elk Grove Village, IL has a box build area that has been optimized for smaller volume box build production enabling unrelated products to share the efficiencies and economies of scale of a standardized work cell arrangement, even though project volumes don't justify a dedicated work cell. Workstations are designed for easy changeover and a dedicated team supports the area, ensuring correct materials are stocked point of use as needed and everything is in place to support the products being built that day. Both its U.S. facilities support a range of higher project volumes, as well.

SigmaTron is able to provide a tailored solution for its customers that can be as limited as PCBA manufacturing and as complex as system integration, fulfillment to end market and repair depot support. The Company also has engineering resources able to support product development activities.

At the OEM level, the benefits of focusing on a TCO approach rather than building assumptions on labor cost expectations or a low unit price that may not completely identify all costs, is a sustainable outsourcing strategy that works as well in year two or three as it does in year one. Additionally, long term contract manufacturing relationships often incorporate improvements that produce levels of

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savings that are greater than originally anticipated as the parties find more efficient ways of working together.

In any outsourcing relationship there are costs associated with inefficiency. Companies that embrace the transfer of knowledge and expertise available with a valued EMS partner can significantly pare down the costs of inefficiency. When that knowledge transfer results in improvements in the OEM's sourcing and transfer of work processes, the savings continue to grow.

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