A Lean-Small Company New Product Development Model

By Steve Mowry

Many of today's high-tech multimedia products are so complex that no single company has all the necessary knowledge about either the technology features or the required processes to completely design and manufacture them in-house. As a result, most companies depend on other sources for crucial elements of their well-being. However, companies have some choice as to whom they depend upon and what sorts of skills and competences they need. Few companies can "do it all" and small companies would be foolish to try. Unfortunately, this situation is only exacerbated for startup companies, but here is where clear choices can and must be made.

In the multimedia and other industries, companies of all sizes are looking for ways to cut concept-to-customer development time, improve quality, and reduce the cost of new products. One approach shown to be successful involves integrating material suppliers early on in the new product development cycle. This involvement may range from simple consultation with suppliers on design ideas to making suppliers fully responsible for the design of components or systems they will supply.

While research shows several benefits to using this approach, execution remains problematic and sporadic. The processes for identifying and integrating suppliers into the new product development (NPD) process are not well understood. This problem is compounded by the fact that design team members often are reluctant to listen to the technology and cost ideas made by Asian suppliers in new product development efforts.

Here is a small company product development model that capitalizes on the inherent simplicity of a small organization and integrates the supplier and OEM manufacturing functions into the process but with "feedback controls." A lean organization containing highly skilled human resources is a company divorced from many of the common resource problems that typically go along with the complexity of scale. Obviously, this places limitation on the application and usefulness of this model for medium to large companies. However, the 10-point development plan applies in an almost universal sense. A test of this small company product development model is that it must address and satisfy at least 9 of the 10 points, while several other aspects of the NPD methodology should be of interest.

CROSS-FUNCTIONAL TEAM

A small company cross-functional development team is illustrated in ***Fig. 1***. Functions and their respective representative resources have paths to each and to signify free exchange of information, which is the result of teamwork.

In ***Fig. 1*** the functions and related in-house or full-time consultant staffing are indicated in blue. Black indicates outsourced external support resources. The purchasing clerk quickly learns about the product from the inside out. By also assigning the Customer Service function to the purchasing clerk, it is assured that the person servicing customers has a good knowledge and understanding of the product(s). Information related to decisions on registration of Patents, Designs, and Trademarks requires the services of a competent Intellectual Property Attorney. Such attorneys perform an important function and are readily available for an hourly retainer fee.

The utilization of a machine and/or a sample shop facilitates the assembly and evaluation of product prototypes in-house and under the control of the development team. In the very smallest companies there may be no budget for CAD support so the project engineer would assume all of the CAD tasks. A single manager in a very small or startup company may perform the Marketing and Finance functions. Finally, the small number of development team members makes it much easier to recruit personnel at high standards with regard to education and experience. The model assumes competent people in all functions. There is little backup in this situation.

The function of top management is not included in ***Fig. 1***; however, its role in product development is central to success. Top management's support is required for product innovation; in fact, top management's main role is to set the stage for product innovation. To best do this management needs to be a "behind the-scenes" facilitator, to focus on forecasting, budgeting, and decision-making (which projects are funded). This role is vital.

Management must make the long-term commitment to product development, and thus company growth.

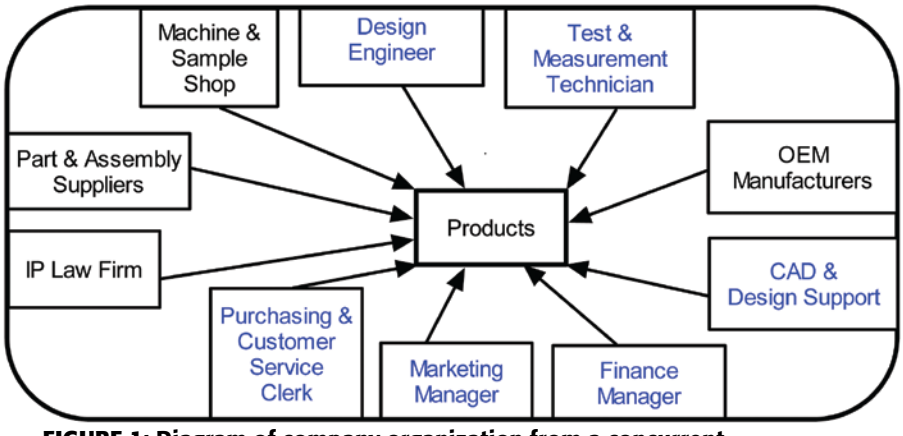

FIGURE 1: Diagram of company organization from a concurrent development perspective.

It must develop a vision, objectives, and a strategy for product innovation; make available the necessary resources and ensure that they aren't diverted to more immediate needs in times of shortage; and commit to a disciplined game plan to drive products to market. And, most important, senior management must empower project teams—not by becoming involved in projects on a day-to-day basis, or constantly meddle and interfere with the project, to micromanage projects from afar, but to provide the needed leadership and a reasonable level of funding.

10-POINT PLAN

There are ten points to consider for a well-controlled design and development project.

1. Assess core competencies—utilize innovation and Industrial Design to add value to the product. Know functional capabilities, strengths, and limitations.
2. Utilize Concurrent Product Planning and Development methodology—Concurrent Engineering and a functionally integrated development. The cross-functional development team should meet regularly and exchange information and ideas freely. No question or concern is "stupid" if asked or expressed in a timely manner. Questions asked in an untimely manner are always inappropriate.
3. Keep the design as simple as possible—practice Design for Manufacture and Assembly (DFMA).
4. Harden specifications before starting—without meaningful specifications that are not a moving target, the product will typically be designed five times.
5. Quality is designed in—perform Failure Modes Effects Analysis (FMEA) and Team Design Reviews at project milestones; commit to Quality Function Deployment (QFD) and use Design of Experiments (DOE) to maximize robustness of products and processes.
6. Design to cost—set reasonable cost targets early on and use make/buy analysis to help minimize costs.
7. Supply chain design—suppliers should be involved early on in the development process. Finance must pay its suppliers on time. Nothing is more disruptive to a project than late or non-payment for project resources.
8. Manufacturing is best suited to manage the development project—"functional silos" and "loose cannons" will significantly increase time to market, cost, and project risk.
9. Use realistic planning and budgeting—don't use typical, average, or expected value task time and costing at a 50% probability, use weighted time and cost estimates for 95% certainty by applying the Central Limit Theorem. The expected value is inherently at only 50% probability.
10. Use comprehensive and easy-to-read documentation including a Detailed Plan Network or Gantt Chart. Documentation is what should define the project, the processes, and the resultant product. A quick review of a company's documentation will typically indicate capability, competency level, and effectiveness of management. Without meaningful project and product documentation, effective project control is unlikely.

All ten points can be implemented within the simplified development model except number 8. In this case, the team must work closely with the suppliers and OEM manufacturers, but this is just not enough. The development team and especially the design and engineering functions must adopt a manufacturing mentality and mindset. Design for manufacture and assembly (www.dfma.com/dfma.htm) and careful supply chain design are now a must.

SUPPLY CHAIN DESIGN

Regardless of the country where the manufacturing takes place, the artisans typically come from the lowest socioeconomic segment of the respective population. As a result, manufacturing inherently is problematic regarding relations and effective utilization labor. The questions should be asked, "Do we want to manage a competitively paid manufacturing workforce? Do we have the core competency to manage manufacturing and quality control? And can we afford to invest in a startup manufacturing facility?"

The model permits a "no" answer to all three questions. The company following this model does not waste skilled resources on layers of management. The development team naturally tends toward the most effective of all schools of management, "self-management."

The flow of a multimedia product development process (***Fig. 2***) illustrates that the management of resources and the control of the development process can be kept in-house and within the development core competencies through Production. By assembling the product prototypes in-house, a greater level of product understanding will result. Thus in the future if manufacturing and/or sourcing issues arise, the development team will be able to troubleshoot the problem quickly and effectively. This will require a lab or sample room with a qualified technician, supported and managed by the project engineer.

Because part and assembly suppliers are selected early, selection of the manufacturer is independent of these suppliers. Second and alternative supply sources for parts and assemblies result in competition and supply backup. This also helps to maintain project control within the core competencies. A second manufacturing source helps to ensure an uninterruptible supply of product to the market and again adds some inherent competition.

The unannounced quality audits are a necessary deterrent for poor Quality Control. The manufacturer cannot substitute inferior parts. The team controls the part and assembly supplier base and monitors manufacturing on a quasi-random basis. Small companies can be competitive in the global economy. They are more insensitive resource markets by potentially utilizing highly skilled resources that could be stationed halfway around the world from the low-cost suppliers

and manufacturers. This is indeed a simple but powerful product development methodology that is worthy of careful consideration for the small organization.

Some observations that have been made regarding companies that integrate suppliers into the development process early and treat the suppliers as development team members are listed here.

1. Some observations that have been made regarding companies that integrate suppliers into the development process early and treat the suppliers as development team members.
2. Increased knowledge of a supplier is more likely to result in greater information sharing and involvement of the supplier in the product development process.
3. Sharing technology information results in higher levels of supplier involvement and improved outcomes.
4. Supplier involvement on teams generally results in a higher achievement of NPD team goals.
5. In cases when technology certainty is present, suppliers and buyers are more likely to share information on NPD teams.
6. The problems associated with technology uncertainty can be mitigated by greater use of technology sharing and direct supplier participation on new product development teams. A supplier's participation as a true member of a new product development team seems to result in the highest level of benefits, especially in cases when a technology is in its formative stages.

COMMENTS

Supplier integration on an NPD project requires a detailed formal evaluation and selection of potential suppliers prior to consideration for involvement. Only trusted suppliers with a proven track record should be approached (at least initially) to participate. Some of the important criteria to consider include the supplier's relative level of experience and capability in new product development as well as their relative level of expertise with respect to a given technology.

Second, sharing technology and cost information early in the process effectively can enable the product development team to begin active discussion of technology options that can meet market requirements. Withholding this information may delay the process, which in turn can lead to a lower probability of target project outcome success.

Third, project outcome objectives should be shared and explicitly should be understood by all parties involved. Although a number of barriers may exist at the project team level when it comes to acceptance of suppliers in the process, direct supplier participation in team meetings (whether through simple consultation on design issues or via a detailed design proposal) can make the difference between a successful or an unsuccessful outcome.

Fourth, supplier involvement on project teams seems to be even more important when the technology is complex or when the buying company does not have a high level of internal expertise in the area. Project teams attempting to apply unique and complex technologies can benefit by including suppliers on teams and by sharing technology information early to be able to capture external expertise early in the process.

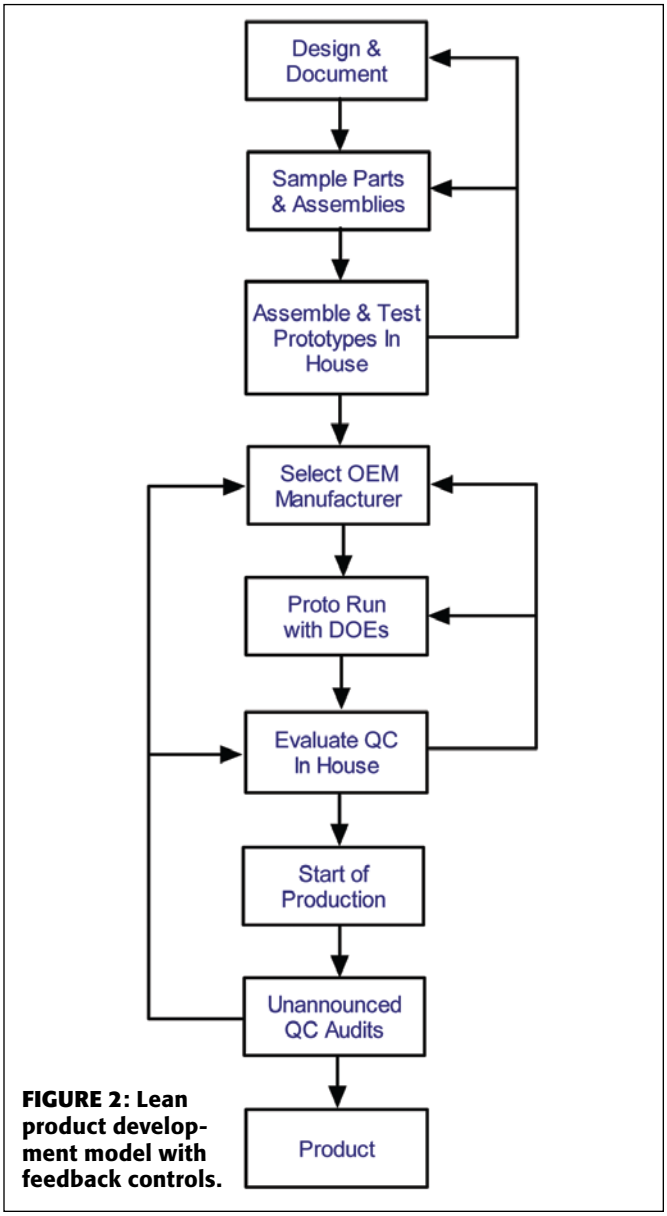

FIGURE 2: Lean product development model with feedback controls.

Steve Mowry, president of SM Audio Engineering, has a BS, Business Administration, from Bryant College, and a BS and MS, Electrical Engineering, from URI with highest distinction. Steve has worked in R&D at BOSE, TC Sounds, EASTECH, and P.Audio. Steve is currently an independent researcher/consultant/lecturer in project management/transducer and system design. His website is www.s-m-audio.com.