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Crisis in R & D Spending

Several industry conferences have recently focused on the “crisis in R&D spending” within the semiconductor equipment industry. Mike Splinter, chief executive officer of Applied Materials, summed up the problem in an interview with Electronic News earlier this year.

“R&D spending averages between 15 percent and 18 percent overall, but there’s hardly ever an average year. It’s difficult for us and our competitors to fit in all that’s required. I believe there is an R&D crisis in the equipment industry.” [Electronic News, April 1, 2005.]

Ron Leckie, president of Infrastructure Advisors, attempted to quantify the R&D gap at ISS Europe in Amsterdam, projecting it to be \$9.3 billion by 2010. [Semiconductor International, Feb. 15, 2006.]

There is no doubt that the pressure to reduce R&D expense while still meeting customer expectations is intense. And, as it is doubtful that R&D funding will increase given such pressures, only those organizations that can improve the productivity of engineering will close the gap.

Most organizations have great difficulty measuring the effectiveness of their development organizations. Various business metrics exist, such as percentage of revenue resulting from new products or revenue per engineer, but these metrics are better measures of a new product’s success than the engineering group’s effectiveness. The most prevalent means of measuring engineering cost is as a percentage of revenue at the corporate level and in engineering cost per hour at the departmental level.

Both methods measure engineering cost, not productivity, and may promote the wrong behavior. (See related article: Reducing Design Cost: A Contrarian View). Achieving effective use of critical engineering resources requires planning and a disciplined approach to managing the interfaces between engineering, marketing and program management. In this article, I will outline three ways an organization can improve the cost effectiveness of the development group.

The first method is to improve the make versus buy decision-making process. Typically, the make versus buy decision is addressed tactically, without senior management involvement, and on a project-by-project basis. Far too often, this results in a backwards approach where tactical necessities drive strategic decisions. An effective make versus buy strategy requires senior management’s guidance on the organization’s core competencies and the leveraging of key supplier relationships for those areas to outsource.

Leaving these decisions to the project team, when the pressure to deliver to schedule is great, leads to poor decisions and a haphazard approach. Often the development team does not have the right skill sets to search and evaluate key partners, and will default to what they know best: developing it themselves. This leads to a lack of focus on core project deliverables and results in engineering being spread too thin to be effective.

The second method is to hold the marketing and program management functions accountable to provide results for the committed funds. In most organizations, providing a budget for the program is



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a required element to proceed into the development phase. Yet once funding is approved, there is virtually no accountability to deliver to the committed budget. Allowing marketing and program management to report on actual spending versus budget as a key performance metric during program execution makes a marked difference in their ability to limit scope creep, set and maintain priorities, and address the true cost of specification changes.

Understanding the actual cost of new requests significantly improves their ability to negotiate with the customer and accurately judge whether the expense is justified. Requiring performance to budget to be presented in program reviews demonstrates that the actual cost of the project or feature is an important criterion in judging project success.

The third method is to create awareness and accountability within engineering for estimating development hours and meeting those estimates. This goes beyond stating when a project will be done; it involves estimating the number of hours they will need to work on the project. Most engineers find it difficult to estimate their time, and will need assistance and a good infrastructure to work within.

Narrowing the scope of what engineering does will help as engineers estimate what they know well. Once there is an understanding of the commitment in terms of development hours, there is a goal and a target for the team to drive towards and balance key development decisions against. There are many organizational advantages once the discipline to estimate and track hours is established. Scope creep is flagged much earlier, the engineer thinks through task definition more fully, and it allows effective capacity planning at the management level.

Inherent in the second and third methods is implementing a simple system for establishing project budgets and tracking actual costs. Budgets must include labor hours, subcontract and material expenses. Actual spending must be tracked on a real-time basis and reported regularly in a simple format. While most organizations track material to the specific project, few track engineering time on an hourly basis to the project, and fewer still reflect that information back to marketing, program management and the individual engineers to help improve performance.

Without accurate real time data, the development team is only guessing how they might improve their productivity. The added benefit of such a tracking system is that it allows better estimates to be made on new programs by providing a database of actual project costs for review.

Implementing the systems described above requires a cooperative, non-judgmental culture. There is a significant difference between accountability and blame. If the tracking and accountability are used for negative consequences, then the organization will spend its time trying to make the numbers look good and make little progress on improving productivity.

Closing the R&D gap will require changing the traditional methods of development. Improving make versus buy decision making, demanding accountability within the marketing and program management functions, and creating awareness of engineering productivity are first steps an organization can take.