TIDE: Promoting Technology Adoption Through Technology Collaboration

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Today, the manufacturing paradigm is evolving from a large number of discrete, monolithic organizations to decentralized suppliers linked in supply chains. To optimize performance, supply chains operate in a highly coordinated manner through virtual manufacturing networks.

Unfortunately, smaller manufacturing enterprises (SMEs) are hard pressed to keep pace with this emerging environment. While there are many reasons for this, one of the most fundamental is that traditional ways of conducting business are not fast, accurate, or reliable enough to keep pace.

In a technology summit held in spring 1998, Congressman Mike Doyle initiated a plan to address this national issue. This plan became the nucleus of the Technology Insertion Demonstration and Evaluation (TIDE) Program. Funded through the Defense Department's Manufacturing Technology Program and managed by the SEI, TIDE focuses on helping SMEs overcome the barriers to technology adoption.

Under TIDE, a number of organizations are collaborating with smaller manufacturers in Pennsylvania on projects that demonstrate the benefits of technology adoption. In addition to the SEI, these organizations include several colleges within Carnegie Mellon University, the National Institute for Standards and Technology, Catalyst Connection (formerly the Southwestern PA Industrial Resource Council), and Duquesne University's Institute for Economic Transformation.

SEI and Carnegie Mellon—Partnering for TIDE Productivity

In essence, TIDE is bringing world-class technical and managerial leadership to SMEs. Much of that technical and managerial leadership results from the joint efforts of the software experts of the SEI and the faculty and facilities of Carnegie Mellon University.

For example, the Software Industry Center (SWIC) is an interdisciplinary industry research center at Carnegie Mellon. As part of the TIDE Program, SWIC staff members and researchers are developing business cases to document the return on investment of advanced technologies. SWIC staff members are also delivering strategic guidance to help TIDE demonstration companies become more effective members of the supply chain for original equipment manufacturers and defense contractors. Finally, SWIC researchers are working closely with these companies and other members of the TIDE program to develop reports and papers. The papers will be published in widely read journals so that other SMEs can benefit from the lessons learned in the demonstration projects.

In another collaboration effort, researchers at Carnegie Mellon University's Robotics Institute and members of the SEI's technical staff are modifying sophisticated scheduling tools, originally developed for the Air Force, to give SMEs a dynamic manufacturing scheduling capability. These new tools will enable SMEs to effectively respond to customer requests and to provide the sudden load capacity their customers frequently demand.

The TIDE program has also established a Software Integration Laboratory at the National Robotics Engineering Consortium facility in Lawrenceville, PA. TIDE personnel are using the lab to help SMEs identify software implementation issues. At the lab, SMEs duplicate their legacy systems and data to examine the interaction with software programs they are considering.

The Results Speak for Themselves

The TIDE program verifies the benefits of advanced technology and paves the way for SMEs to adopt it. In the first demonstration project, TIDE personnel helped Carco Electronics to implement 3D solid modeling and finite element analysis software. Staff members from the SEI and Duquesne University's Institute for Economic Transformation examined Carco's needs and current processes. Based on the findings, they conducted three in-house training programs on solid modeling and functional economic analysis (FEA). TIDE personnel also recommended that Carco increase bandwidth on its computer network to improve modeling speed, and that Carco double its number of software licenses so that more drafters could access them. They also worked with Carco leadership to incorporate solid modeling and in-house FEA as part of the company's strategic vision.

Previously, Carco used computer-aided design (CAD) modeling and FEA to validate components and systems before assembly. Now it is using CAD and FEA early in the design process. As a result, drafting and design time have decreased by 25%. Turnaround time for solid model drawings has dropped from weeks to days. On a recent project, the number of engineering change notices decreased from an average 15 per effort to 1.

When the Kurt J. Lesker Company adopted advanced CAD capability through TIDE, it achieved similar results. To date, the company has decreased engineering cycle times by approximately 20% on new systems and 30% on redesigns. The company has reduced engineering hours for designs of individual components by 25%. And engineering time for products built from stock mechanical components has decreased by 50%.

Evaluating Lessons Learned

While each project features specific results, several lessons apply to nearly all the technology-adoption efforts. The first is that advanced technology is more than a tool. Used effectively, it can be one strategy to help SMEs achieve business goals. By viewing technology as a strategy, managers can look for ways to apply the same technology throughout their organizations. For example, Carco Electronics is now using its 3D CAD modeling software to represent its ideas in proposals, and has won new business as a result.

Another lesson is that implementing technology often requires non-technological changes. Depending on the organization, there may be organizational issues: who uses the software, designers or engineers? There may be operational issues: how many copies of the software must be purchased? There may be cultural issues: how should sales/marketing and engineering work together when preparing bids, proposals, and sales presentations? The point is, the technology does not exist in isolation. To implement it effectively, SMEs have to consider its effect on all of their business processes.

A third lesson is that, properly implemented, the technology can yield results that are greater than imagined. Certainly, advanced technology can reduce errors and rework, increase productivity, and improve design and engineering quality. But it can also strengthen customer relationships, improve employee morale, and lead to a culture of continuous improvement.

The TIDE program is disseminating the lessons learned and information on the demonstration projects through articles in trade and industry publications, papers in business journals, technical notes, workshops, courses, and the TIDE Web site. The TIDE program is also sponsoring a regional conference September 24, 2002, in Warrendale, PA. The conference will cover overcoming barriers to adopting advanced technology, and will include presentations from the SEI, participating SMEs, and other organizations.

The goal of these activities is two-fold: first, to improve the capabilities and competitiveness of small manufacturers throughout the country, and second, to encourage large original equipment manufacturers and defense manufacturers to partner with SMEs in their supply chain organizations.

By documenting the benefits of advanced technology, helping SMEs overcome barriers to adopting it, and publicizing the results, the TIDE program is enabling small manufacturers to succeed in a supply-chain-centric world while improving the defense industry in the United States.

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