Nanomanufacturing: Turning Bright Ideas into Tomorrow's Products and Processes

Creating more effective connections from innovation to implementation.

Lea A.P. Tonkin

Somewhere in the twilight between innovation and commercialization, many great ideas fall into the ether, never to reappear. Planners of the "Nanomanufacturing & Dual Use Commercialization Conference" held recently in Savannah, GA, aim to change that scenario. They brought together industry and government technology representatives, along with people from research and development/academic organizations, for the event. The conference was sponsored by the National Nanotechnology Manufacturing Center (NNMC), Swainsboro, GA. AME was among the co-sponsors. "We want to understand the challenges, identify resources, create connections, develop more thoughtful choices, and create a call for action. All of these resources are learning to come together in a collaborative network," said Dr. Diane Lewis, NNMC board member.

Noting unmet needs in the military, manufacturing, and other markets, Lewis said the NNMC is research-oriented and also seeks to enhance greater access to nanotechnology innovations and potential applications. "Innovation is only one element of the success equation," said Lewis. "In the nanotech arena as in many fields, you need visionaries and users who can put these bright ideas into tomorrow's processes and products." Funding and obsolescence are among the hurdles to successful fielding of new ideas, Lewis said, adding, "We need to understand the players and resources in the field and learn how to create more connections among them."

Escaping the "Valley of Death"

Powerful forces work against innovation's transition to actual use, according to Dr. Ted Glum, director of the Defense Microelectronics Activity (Department of Defense —

In Brief

The promise of better products and processes is an innovator's vision. Translating this vision to reality requires collaboration and a process for fostering successful implementation, as participants in the recent Nanomanufacturing & Dual Use Commercialization Conference learned.

Definitions

Nanomanufacturing refers to manufacturing at the nanoscale by assembling from a "bottom-up" approach. It is also often used to describe manufacturing with nanoscale materials.
Nanotechnology is the study and use of materials at the nanoscale, widely accepted as having at least one dimension of between one and 100 nanometers.

DoD). Budgeting processes, for example, hinder rapid insertion of nanotech and other innovations. What he described as a "valley of death" is the lengthy (an average of two years or more) and sometimes unsuccessful path from the development side to the field. DoD has pushed for procedure changes and creation of new manufacturing readiness milestones to enable faster testing and use of new technologies, hoping to trim developers' cost and risk.

Nanotechnology has the potential to revolutionize many processes and capabilities, according to Glum. He added that global sourcing trends accentuate the DoD's interest in creating more domestic capacity. Projecting an increasing percentage of manufacturing capacity outside the United States and Japan, Glum shared concerns about counterfeiting and security. "Counterfeiting has exploded in the past couple of years," Glum said. The biggest problem is substituting CPU (central processing unit) and other parts that can cause failures or be related to "Trojan horses" and other computer headaches. Glum

Great Idea! Now What Do We Do With It?

Will the next battleground for organizational improvement center on innovation? According to a recent survey by Towers Perrin, companies are often better at creating good ideas than turning them into usable products and processes. Although the majority of their "Art of Successful Innovation" survey respondents remain committed to investing in research and development (R&D), their focus tends to short-change implementation.

More than 1200 executives from organizations in the United States, Mexico, Canada, and Brazil were polled in the survey. The project targeted views and commitment to three phases of innovation: creation, selection of ideas to pursue, and implementation (building and commercializing).

Forty-four percent of the survey respondents said their company was not good at moving rapidly from creation to implementation, while 42 percent believed their companies fared well in this transition. "The finding that organizations rate themselves poorly when it comes to implementation is a serious concern because taking action — commercializing an idea — is what innovation is all about," said Jim Foreman, managing director of the firm's Human Capital Group. "Our experience suggests that this breakdown occurs because of a tendency to put a lot of time, energy, and resources into the external 'invention' side of innovation, often to the exclusion of an internal focus that helps create a sustained institutional capability. But without that capability, it's much harder to move an idea out of the proverbial laboratory and into the marketplace, regardless of the nature of the product or service."

Reported barriers to successful implementation of new ideas and technology included aversion to risk (59 percent of respondents indicated this issue), limited or no ability to measure ROI of innovation (52 percent of respondents), and internal processes and structures (48 percent of survey participants).

"In today's environment, innovation can and should take shape anywhere and everywhere in the business model, from the way people work, to the way an organization makes money, to its structure and operations," said Foreman. "Failing to build a capability that takes all of these elements into account is part of the reason many good ideas ultimately languish or miss their moment." He said the survey highlighted three factors that build innovation sustainability:

1) An understanding that innovation has external and internal (process and structure) components that should work in tandem and require different organizational capabilities
2) Leadership commitment to the internal side of innovation and the building and sustaining a related "machine"
3) Recognition that different groups in the organization enter and exit the innovation process at different points in time and in different ways. Alignment in each phase among these groups and related organizational capabilities and resources are needed to turn ideas into reality.

called for progress in strengthening government-industry partnerships that will ensure high-quality, flexible systems and parts for the DoD.

Mark Mezger, business development manager of the U.S. Army Armament Research, Development, and Engineering Center (RDECOM-ARDEC) shared his organization's efforts to "get the right technology to the right place, at the right time, for the war fighter." They're developing a rapid innovation model that can more effectively shepherd technology to the field, and encouraging development of strategic partners (public-private partnerships), such as the Nano Valley Consortium (NVC). According to Tracy Becker, NNMC operations manager and executive agent of the NVC, their consortium is working closely with ARDEC in finding solutions to the war fighter's challenges. "We've designed the NVC specifically as the public-private partnership ARDEC is looking for in nanotechnology," said Becker. "Our organization is open to any organization looking to expand in this forum (www.nationalnano.info).

Added Resources for Nanotech Developers, Potential Users

Additional resources and counsel during the conference included:

- Nanotechnology developers and potential applications partners can find related resources and connections through the Federal Laboratory Consortium (FLC) for Technology Transfer (www.federallabs.org), according to Dr. J. Scott Deiter, chair of the consortium and also a representative of the Indian Head Division of the Naval Surface Warfare. The FLC's mission is to add value to the federal agencies, laboratories, and their partners to rapidly integrate R&D resources within the mainstream of the U.S. economy. This nationwide network of federal laboratories offers a forum for sharing and fostering strategies for linking lab mission technologies and the marketplace. Among its activities: developing and testing transfer methods, addressing barriers to the process, sharing best practices, providing training, and emphasizing national initiatives where technology transfer plays a role. Liaison groups in nanotechnology and other fields encourage effective technology transfer. Deiter suggested that additional nanotechnology and nanomanufacturing contacts are www.manufacturing.gov, www.nano.gov, and www.nationalnano.info.
- Intellectual property and value extraction issues faced by nanotech developers and others were discussed by representatives of Woodcock Washburn LLC.
- Doreen Edelman of the law offices of Baker Donelson Bearman, Caldwell & Berkowitz, PC described export compliance procedures and penalties for compliance failure, suggesting that a related management policy and compliance training for all employees are needed.
- Heather Benko, manager, nanotechnology standardization activities, American National Standards Institute (ANSI) counseled that standards play a major role in global merchandise trade, as well as in encouraging development and commercialization of technologies. Check the website www.ansi.org for information on nanotechnology standards.
- Kirk Eaton of Acuity Brands Lighting, representing AME, shared basics of improvement and lean operations. He noted the importance of senior leadership involvement in achieving and sustaining organization-wide improvements.

Nanotechnology has the potential to revolutionize many processes and capabilities …

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