Crossing over: tackling technology transfers

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Academia and industry both face the challenge of how to transfer technology from research to commercial production. Passing technology from university to industry or from one industrial research group to another involves the transference of skills, knowledge of manufacturing practices, patents and, often, moving operations to a different facility.

The most important success factor in moving from research to product, often called "crossing the valley of death," is using a collaborative, team-based approach that integrates the methods outlined above.

This process requires that the team address key issues at the beginning of the project. The first issue is developing well-defined program goals, which start with an agreement on program readiness. Many organizations use the Technical Readiness Level methodology, established by NASA, while others adopt a less-formal structure to assess program readiness. All parties must agree on definitions and goals—an outcome more difficult to achieve than you might think.

For example, an academic researcher might define a prototype as a piece of hardware assembled from parts made from different production runs. That prototype could be used for demonstration purposes. However, an industrial partner involved in that same project might define a prototype as hardware built from parts from the same dedicated production run. That prototype would be closer to being manufacturable. The right answer to the "what is a prototype" question is the one to which all parties agree.

The program also must have well-defined, measureable and time-bound milestones. This affects the most critical success factor: resources to support the technology-transfer program. Such resources include personnel (numbers and talents), facilities and materials. Inadequately resourced programs frustrate all involved.

Done correctly, a technology-transfer program moves from a feasibility prototype, which requires extensive involvement from researchers, engineering support and facilities, to a production prototype, which requires manufacturing engineers, licenses and testing procedures.

Different roads to success

While all successful technology transfers require a high-functioning team, there are different ways of succeeding. For example, universities commonly license patents to established manufacturers that then introduce products to the market based on the research. This method typically requires continued support by university researchers to assist transferring "know-how." Another method is licensing the patent to a start-up company established by the university inventors. This method is advantageous because know-how is in-house.

Universities often can help transfer technology by providing companies access to unique equipment on a fee basis. This allows companies to develop products without having to invest in expensive laboratory equipment. Development time is also reduced since the laboratory facility is immediately available to the companies, also on a fee basis.

Most facilities, such as the University of Michigan Lurie Nanofabrication Facility, also can train and assist company personnel. The LNF is part of the National Science Foundation National Nanotechnology Infrastructure Network, which supports such personnel training.

Multiple methods

Universities transfer know-how to companies several ways. One is to have faculty members serve as consultants to the company. Another is for the company to hire student researchers as interns or permanent employees.

The University of Michigan Center for Wireless Integrated MicroSensing & Systems (WIMS2), for example, has successfully employed all of these methods. WIMS2 also allows its corporate members to locate engineers at WIMS2 facilities, allowing easy access to the LNF, faculty and students. The resident-engineer approach allows company personnel to conduct product-development work. All technology developed by a company's personnel belongs to the company.

WIMS2 and the University of Michigan have also been involved with companies founded by faculty and students to commercialize research. Examples include HandyLab Inc. (maker of molecular diagnostic assays and automation platforms) and Sensicore Inc. (smart sensor systems and sensor networks), companies that subsequently were acquired by larger firms. Other examples are Discera (MEMS-based timing solutions), Ambiq Micro Inc. (producer of ultralow-power, mixed-signal integrated circuits) and ePack Inc. (MEMS packaging), which are independent companies.

WIMS2 also has fabricated specific hardware samples for use by its members. These samples are derivatives of the specific items that resulted from WIMS2 research projects. This allows a company to evaluate a proprietary idea quickly and at minimal cost. WIMS2 staff also provides technical know-how to help member companies fabricate proprietary structures.

Universities can augment a project any number of ways, thereby enriching the technology-transfer process for the member-company. To optimize the transfer experience, both the university and company need to remember two things: Technology transfer is a truly collaborative effort that involves team members interacting to solve issues that will inevitably arise during the process, and technology transfers with people, not paper. µ

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