*Lessons from Unsuccessful Projects*
*in the Advanced Technology Program*

**Four out of Five Unsuccessful Projects are Technical Successes**

The Advanced Technology Program (ATP) documents successful and unsuccessful projects through Status Reports, which are mini-case studies written over 5 years after ATP funding ends. Projects that are not successful may fail for technical or commercial reasons. To date Status Reports have been completed on 182 projects, of which 56 were overall unsuccessful. To facilitate the evaluation of each project, a performance rating system is applied during the course of preparing a Status Report. This system is called the Composite Performance Rating System (CPRS).[1] The CPRS is constructed using a set of metrics to show overall progress in three areas:

1. Adding to the nation's scientific and technical knowledge;
2. Disseminating the knowledge;
3. Commercializing new and improved products and processes from the technology developed.

Projects with a performance rating of 0 or 1 star are generally those that have demonstrated few outward signs of either technical or commercial progress and, for purposes of this report, are classified as unsuccessful. This group also includes those projects that showed early signs of progress, but then faltered. Projects receiving performance ratings of 2, 3 or 4 stars have demonstrated a degree of both technical and commercial progress ranging from technologies that may take more time to develop to those fully commercialized. This fact sheet examines those projects that received CPRS scores of 0 and 1 star.

Of the 56 unsuccessful projects, 43 (77%) were technically successful but did not result in a commercial product or process. Because ATP funds high-risk research, it is expected that some projects will not succeed. These unsuccessful projects include ones that never got off the ground, are terminated before completion, or show no or few outputs. In practice, however, most achieve some results, such as by producing patents, papers, collaborative relationships, or products. This fact sheet presents some of the reasons why a project may have been technically successful but did not achieve commercial success.

<u>Unsuccessful Projects</u>

The primary reason for an unsuccessful project identified in more than one third of the projects examined is that industry changes resulted in technology obsolescence. This may be reflective of the types of technologies identified as high risk as well as the fact that a typical project is 3 years in duration and often takes several additional years to commercialize. The second most recognized reason, identified by one in five companies, is losing out to competition. Competition can come from domestic as well as foreign companies. One in six companies cites the inability to attract additional funds with the same percentage identifying the market as not being ready for the technology as the primary reasons for their low performance rating. The very nature of ATP technologies (high risk and long term development) implies that there is a good chance that markets may not be ready when

[1] Rosalie Ruegg.. "Bridging from Project Case Study to Portfolio Analysis in a Public R&D Program: A Framework for Evaluation and Introduction to a Composite Performance Rating System." U.S. Department of Commerce Advanced Technology Program. NIST GCR 06-891, April 2006.

the ATP technology is developed. Finally, other companies cite the high cost of additional research or the high cost of production as the primary reason for lack of success.

Table 1 presents the primary reasons for low performance ratings for projects reporting technical success.[2]

Table 1: The Primary Reason for the Low Performance Rating Received for 43 Projects Reporting Technical Success

| Primary Reason | Percent of Completed Status Reports (43) |
|---|---|
| Industry Changes Resulting in Technology Obsolescence | 35% |
| Losing out to a Competitor | 19% |
| Inability to Attract Additional Funds | 16% |
| Market not Ready for the Technology | 16% |
| High Cost of Additional Research | 7% |
| High Cost of Production | 7% |
| Total | 100% |

**Examples of Unsuccessful Projects**

- **Industry changes resulting in the obsolescence of the proposed technology**
  In the mid-1990s, optical tapes held about 200 to 300 gigabytes of data. If optical tapes were going to be a viable alternative to magnetic tape technology, improvements in storage capacity would be necessary. LOTS (Laser Optical Tape Storage) Technology, Inc. developed a digital data storage technology that used a laser to write data quickly on high-density optical tape, a process that would be much faster than the current magnetic tape technology.

  LOTS Technology, Inc. demonstrated several of their technical accomplishments to the Institute of Electrical and Electronics Engineers at the Mass Storage Conference in 1997. If successful, the new technology would help U.S. government agencies and commercial industries store their records much more efficiently. The company received one patent, published one article, and after the project ended LOTS received two grants from another government agency to further develop the technology. But during the course of the project, the attention given by the industry to the digital compact disc (CD) and the digital video disc (DVD) made optical tape technology obsolete.

[2] The first four reasons are from the paper prepared by Rosalie Ruegg , "Bridging from Project Case Study to Portfolio Analysis in a Public R&D Program: A Framework for Evaluation and Introduction to a Composite Performance Rating System." U.S. Department of Commerce Advanced Technology Program. NIST GCR 06-891, April 2006. The last two reasons are themes that emerged upon reading the Status Reports.

- **Losing out to a competitor**
  In the early 1990s, true green or blue light-emitting diodes (LEDs) with enough intensity for commercial applications were not available. Eagle-Picher and North Carolina State University (NCSU), through the ATP project, had achieved groundbreaking developments in creating zinc selenide blue and green lasers and LEDs that exhibited superior output capabilities. The blue LEDs were approximately 40 times brighter than commercial Silicone Carbide (SiC) LEDs, and the green LEDs were 50 times brighter than Gallium Phosphide (GaP) green LEDs.

  Eagle-Picher's laser and LED prototypes had life spans of approximately 5,000 to 8,000 hours; however, Nichia, a Japanese firm, successfully developed a Gallium Nitride (GaN) blue LED with a life span in excess of 10,000 hours. Eagle-Picher was not able to compete with Nichia but was able to use the knowledge gained during the ATP project to redirect its research into further improvements in zinc oxide-based lasers and LEDs.

- **Inability to Attract Additional Funds**
  In 1995, the DNA diagnostics industry was exploring ways to test patients for over 4,000 known diseases in order to facilitate early, accurate diagnoses and customized treatments. The technology could open the path to cost-effective, rapid, automated diagnostics for simultaneously detecting such maladies as cancer, genetic and infectious diseases.

  Vysis, Inc., a small DNA testing company, was able to demonstrate their project’s technical concepts. They received three patents for their advances; published papers describing their research; collaborated with Cepheid, a genetic analysis company; and received follow-on funding from the Defense Advanced Research Projects Agency (DARPA). However, in order to develop a marketable product, the project needed additional financial resources, which Vysis was unable to raise.

- **Market not Ready for the Technology**
  By the early 1990’s the U.S. healthcare industry began moving away from a fee-for-service system towards consolidation and cost containment. In response to this the Koop Foundation formed a joint venture to create middleware, called Health Object Library ON-Line (HOLON), which enabled information technology systems to play a larger role in providing an integrated delivery system. The joint venture met all technical goals and held successful testbed demonstrations. In addition, public access was granted to much of the knowledge developed through a series of symposia, reports, and conferences on healthcare informatics. But, the healthcare industry was not ready for the technology. Discussions surrounding the development of an integrated system had faded from industry discourse. Even though the impetus behind the technology development was to facilitate a national healthcare infrastructure, Lumina Decision Systems, a member of the joint venture, was able to incorporate the technology developed in this project into their new decision-support products.

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