PART 4

Commercialization of the New Technology

New technical knowledge must be used if economic benefits are going to accrue to the nation. This generally means that a new product or process is introduced into the market by the innovating firm, its collaborators, or other companies that acquire the knowledge. In competitive markets, the producer is typically unable to capture all the benefits of a new product or process, and the consumer reaps part of the benefits. The higher up the supply chain the innovation occurs, the more value-added steps there are before final consumption, and the more intermediate firms in the supply chain may benefit, in addition to the final consumer.[7] It is through commercialization that society reaps the benefits of new technology, such as reduced product costs, improved efficiency, enhancments to health and welfare, and economic growth.

Commercialization of Products and Processes—A Critical Step Toward National Benefits

Sixty-four of the projects had already spawned or expected to bring to market 143 new products or processes when the data for this report were collected. Companies in 13 additional projects expected to achieve their first commercialized results shortly[8], and companies in 14 projects that had already commercialized their technology expected to add new products and processes soon. Thus, 77 percent of the projects had spawned one or more products or processes in the market or were expected to do so shortly, for a total of 161 products or processes either on the market or expected shortly after the time the data were collected. Table 4.1 summarizes the commercialization results.

A number of additional years have passed since the data for the first 50 projects were collected. Since that time, further developments have doubtless occurred with these projects, which have changed their commercialization results. This overview reports commercial progress of the first 100 projects, all at approximately comparable times following their completion.

A Quick Glance at the New Products

A variety of new products and processes resulted from the projects. For a convenient, quick reference, brief descriptions of the new products or processes for each project are listed in column C in Tables A.1–A.5 in Appendix A. For each new product or process, the new technology on which it is based is also listed in the tables, in column B.

Commercialization: A Critical Step, but Not the Final Word

Commercializing a technology is necessary to achieve economic benefit, but it does not ensure that the project is a full success from the perspective of either the company or ATP. Widespread diffusion of the technology may or may not ultimately follow the initial commercialization. Nevertheless, it is significant that these products and processes are actually on the market.

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[7] For a detailed treatment of the relationship between spillover benefits (knowledge, market, and network spillovers) and commercialization, see Adam B. Jaffe, *Economic Analyses of Research Spillovers: Implications for the Advanced Technology Program*, GCR 96-708, (Gaithersburg, MD: National Institute of Standards and Technology, December 1996). He notes: "Market spillovers will not be realized unless the innovation is commercialized successfully. Market spillovers accrue to the customers that use the innovative product; they will not come to pass if a technically successful effort does not lead to successful commercialization" (p. 12). In commenting on spillovers that occur because new knowledge is disseminated to others outside the inventing firm, he observes: "Note that even in the case of knowledge spillovers, the social return is created by the commercial use of a new process or product, and the profits and consumer benefits thereby created" (p. 15).

[8] "Shortly" refers to the time when the question is asked. Since Status Reports are written about 5 years after ATP funding ends, the perspective is the same for all status reports. So, when a company answers that they expect a product or process on the market soon or shortly, they are referring to new product commercialization in the next 3 to 12 months.

Table 4.1 Progress of Participating Companies in Commercializing the New Technologies

Degree of Progress	Number of Projects	Number of Products/ Processes
Products/Processes On the Market and Expected Soon	14	46
Products/Processes On the Market with None Expected Soon	50	97
No Products/ Processes On the Market with At Least One Expected Soon	13	18
Total Products/Processes On the Market or Expected Soon	77	161

Source: Advanced Technology Program First 100 Status Reports

Rapidly Growing Companies

Rapid growth often signals that a small innovating company is on the path to taking its technology into the market, and one dimension of company growth typically is its employment gains.[9]

Figure 4.1 shows employment changes at the 60 small-company, single-applicant ATP award recipients.[10] Twenty-eight percent of these companies experienced job growth in excess of 500 percent from the beginning of the project until several years after the project had completed. Thirty-six percent—the largest share—experienced job growth in excess of 100 percent, ranging up to 500 percent.

Not all the small companies grew. A little less than one-fifth of them experienced no change or a decrease in staff. Several of the companies that were small when they applied to ATP grew so rapidly they moved out of the small-size category. As a group, of the 60 small single-applicant companies, 39 companies at least doubled in size; 12 of them grew more than 1,000 percent. ATP helped these companies develop advanced capabilities, which they subsequently leveraged into major businesses.

For example, Vitesse had approximately 200 employees when it applied to ATP, but had nearly 800 at the time it was profiled for inclusion in the 2001 report of ATP's first 50 completed projects. Now the company has more than 900 employees.[11] Another, Cree Research, Inc., had 41 employees at the project start, 210 when it was included in the 2001 report of the first 50 completed projects, and now it has more than 1,000 employees.[12] Yet another, Integra LifeSciences, grew from 32 employees at the beginning of the project to 129 at the time the data were collected for the second 50 completed projects, to 760 as currently reported.[13] At least one of the companies that was quite small at the time it applied to ATP—GelTex Pharmaceuticals, Inc.—has since changed size categories as a result of being acquired by a large company, Genzyme.

The following examples illustrate the potential impact of ATP funding on the technological and commercial prospects of funded companies.

Digital Optics: In the late 1990s, as the labor-intensive integration and packaging of optoelectronic components was causing customer costs to rise, Digital Optics faced the prospect of a loss of business to inexpensive overseas competition. Supported by $1.7 million in ATP funding, Digital Optics achieved its goal of developing an integrated micro-optical systems (IMOS) R&D initiative that resulted in its commercial launch of the patented Photonic Chip™.

The company, which grew from a staff of 35 at the project's start to 130 employees as of December 2001, has applied for 42 patents since the project launch and has become the leader in integrated optical modules. Well respected in the marketplace, its technology is positioned to become the primary production method for integrated optical subassemblies (OSAs). Moreover, with the financial resources necessary to anticipate market trends and act on emerging opportunities, the company has taken the steps necessary to pursue new opportunities in the data storage, telecommunications, and data communications markets.

[9] Employment within the small companies is considered here as an indicator of commercial progress. Assessing macroeconomic employment gains from the technological progress stimulated by the 100 projects is beyond the scope of this report.

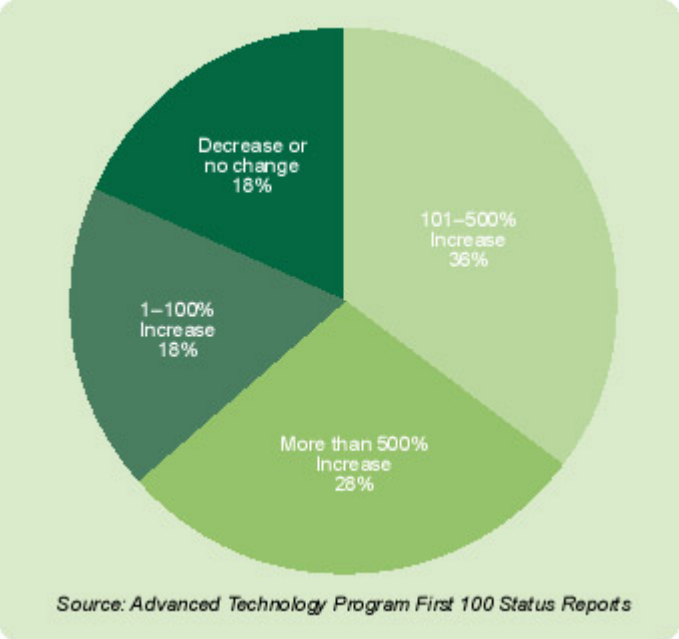
[10] Employment changes in joint ventures, larger companies, and nonprofit organizations are less closely tied to the success of individual research projects, and, therefore, are not included in the employment data in Figure 4.1.

[11] Current employment data were obtained from Market Guide, Inc. (2003), an on-line database of descriptive and financial information on publicly traded companies.

[12] Market Guide, Inc. (2003).

[13] Ibid.

Figure 4.1 Employment Change at Small Companies that Received a Single-Applicant Award



Source: Advanced Technology Program First 100 Status Reports

Although the telecommunications market contraction since 2001 has created a less than optimal environment in which to market new technologies, the company has experienced continued growth and has outperformed its competitors. Once current adverse market conditions begin to subside, the Photonic Chip™ and its IMOS technology will position Digital Optics to compete successfully for new customers and play a leading role in further advances in optical integration.

Displaytech, Inc.: Continued, rapid advancements in emerging large- and small-screen display applications (as well as consumer expectations of these products and their prices) created a need for technology to replace traditional Liquid Crystal Displays (LCDs). The next-generation solution had to be smaller, faster, and deliver more power while using less power. Displaytech invented and demonstrated just such a solution in Ferroelectric Liquid Crystal (FLC) technology. However, it had to overcome significant capital obstacles to put its new manufacturing process strategy in practice. To meet that challenge, the company proposed a new process that could reduce the net cost per unit by 99 percent and increase the daily yield from 4 to 500 units per operator. A two-year ATP award of $1.7 million made the successful launch of this manufacturing process possible and led to the commercialization of a new line of devices. Without this funding, the best-case scenario was a cost reduction of 80 percent.

The company's success extended beyond development of the technology required to mass-produce FLC display chips to significant process improvements that generated a 600-percent increase in image quality, a 100-percent extension of product lifetime, and a 97.4-percent reduction of cost per unit (from $6,000 to $160). These achievements increased the number of potential applications for FLCs, both within and beyond the electronics industry, and created an opening for U.S. firms in the Japanese-dominated display market. Displaytech, which grew from 20 employees at the start of the project to a staff of 150, realized production capabilities of 100,000 displays per month as of early 2000.

Ebert Composites Corporation: When market demand for electricity skyrocketed in the early 1990s, options for increasing supply seemed limited to those that were economically burdensome and/or environmentally unacceptable. Ebert Composites Corporation proposed and successfully created prototypes of corrosion-resistant, lightweight, nonconductive structures. Bar-coded for quick snap-together construction, they were nearly 50 percent lighter than steel; their advantages also included lower life cycle and installation costs and reduced environmental risks in comparison with steel towers or wooden poles.

Now a joint venture, Strongwell-Ebert, LLC has commercialized the composite structures for electric power poles and lattice towers that are sold and used throughout the United States within the electric power industry and may have market applications in other industries, as well. The company, which had 12 employees at the start of the project, had grown through the joint venture to nearly 865 by September 2004 and had established sales sufficient to fund operations as well as future R&D projects.

Capital Attraction

Attraction of additional capital is another signal that a company is positioned to make further progress. Of the 100 projects, 69 had attracted additional capital to further pursue development of their technologies. Additional funding came variously from collaborative partners, venture capitalists, public offerings of stock, other governmental departments including state government programs, and other sources.