Technology Administration

Mission Statement

Technology Administration: TA's mission is to work with U.S. industry to maximize technology's contribution to U.S. economic growth by maintaining and improving key components of the nation's technological infrastructure; fostering the development, diffusion, and adoption of new technologies and leading business practices; creating a business and policy environment conducive to innovation; and disseminating technical information.

The Technology Administration (TA) works with U.S. industry to maximize technology's contribution to U.S. economic growth. Led by the Under Secretary for Technology, TA fulfills its broad responsibilities through its component organizations: the Office of Technology Policy, the National Institute of Standards and Technology (NIST), and the National Technical Information Service (NTIS).

Overview of Component Bureaus

Office of Technology Policy (OTP)

The TA's Office of Technology Policy (OTP, or US/OTP) supports technology-led economic growth through a range of programs and policy development activities, addressing both domestic and international matters, that work as a whole to identify key policy needs and options; strengthen the capacities for technological innovation by the nation's industry and science & technology (S&T) community; and hasten the transfer of new scientific and technological advances to the private sector for commercial development. In support of the Under Secretary's responsibilities and the Commerce Department's leadership role in civilian technology policy, OTP provides timely analysis, support services, and value-added information to other TA and Commerce Department bureaus, the Secretary of Commerce, the White House, and other federal agencies.

National Institute of Standards and Technology (NIST)

The National Institute of Standards and Technology (NIST) operates under the authority of the National Institute of Standards and Technology Act (15 U.S.C. 271), which modifies The Organic Act that created the National Bureau of Standards (NBS) in 1901. In 1988, Congress renamed NBS as NIST, and also established the Regional Centers for the Transfer of Manufacturing Technology (15 U.S.C. 278k) and the Advanced Technology Program (15 U.S.C. 278n). The National Quality Program was established and its functions were assigned to NIST by the Malcolm Baldrige National Quality Improvement Act of 1987 (15 U.S.C. 3711a).

NIST develops and disseminates measurement techniques, reference data, test methods, standards, and other infrastructural technologies and services required by U.S. industry to innovate and compete in global markets. In addition to its core measurement, testing, and standards functions, NIST also conducts several extramural programs, including the Advanced Technology Program, to stimulate the development of high-risk, broad-impact technologies by U.S. firms; the Manufacturing Extension Partnership, to help smaller firms adopt new manufacturing and management technologies; and the Baldrige National Quality Program, to help U.S. businesses and other organizations improve the performance and quality of their

operations by providing clear standards and benchmarks of quality. This plan includes, for each NIST program, a performance logic model that describes the chain of value-creation from inputs to end-outcomes, and that links performance evaluation methods to each stage of the impact path; these logic models are presented below with respect to each program's performance information for FY 2002.

National Technical Information Service (NTIS)

The National Technical Information Service (NTIS) operates a central clearinghouse of scientific and technical information that is useful to U.S. business and industry. NTIS collects scientific and technical information; catalogs, abstracts, indexes, and permanently archives the information; disseminates products in the forms and formats most useful to its customers; develops electronic and other new media to disseminate information; and provides information processing services to other federal agencies, without appropriated funds. NTIS' revenue comes from (1) the sale of technical reports to business and industry, schools and universities, state and local government offices, and the public at large and (2) from services to federal agencies that help them communicate more effectively with their employees and constituents.

Priorities/Management Challenges

OTP

OTP's overarching goal is to provide leadership in promoting national technology policies that facilitate U.S. pre-eminence in key areas of science and technology and to leverage technological innovation to strengthen U.S. global competitiveness. Underpinning this goal are three key action areas: outreach, analysis/education, and advocacy. Throughout FY 2002, OTP focused these actions in four priority areas that encompass the three action areas, but provide a more meaningful framework for understanding the outputs provided by the Office of Technology Policy. The framework and relationship to the three key action areas are outlined below:

Support and improve the innovation system of the United States — To achieve this goal, OTP led interagency working groups, community outreach events, and workshops (outreach); identified barriers and best practices of the innovation system of the U.S. (analysis); and increased the understanding of U.S. innovation through the publication of policy papers and regulations, and promotion of the Medal of Technology Program and the GetTech Web site (advocacy).

Advance the role technology plays in U.S. economic growth and homeland security — OTP facilitated dialogue and interaction between policymakers, developers, and users of emerging and productivity-enhancing technologies (outreach and advocacy) with the goal of promoting adoption by business, education, medicine, and research groups (education and advocacy).

Strengthen the competitive position of U.S. technology industries — OTP examines the effects of globalization and policies on U.S. high tech industries and the S&T workforce (analysis). Data are collected from domestic and international counterparts (outreach), and results are used to highlight actions and recommend policies that may help foster U.S. competitiveness (educate and advocate).

Strengthen OTP's organization, capabilities, and resources to maximize the effectiveness of its activities and services — OTP conducted a comprehensive *Workforce Restructuring Plan* in FY 2002 to bring the organization into alignment with the President's Management Agenda, and outlined an approach for U.S. industry and the S&T community to structure its workforce to embrace important policy issues such as globalization and technology-led economic development. In addition to press briefings, workshops, and roundtable discussions, OTP used electronic means to inform Congress, U.S. government agencies, and the public about OTP analytical findings (outreach and advocacy/education).

NIST

Three of NIST's priorities for FY 2002 are reflected in the program performance information provided below: NIST's focus on technical infrastructure for twenty-first century innovation is reflected in performance goal 2; NIST's focus on opportunities for small manufacturers is reflected in performance goal 3; and NIST's focus on quality and accountability in heath care and educational organizations is reflected in performance goal 4. Construction and facilities remain an independent and urgent priority for NIST, and its ability to respond to these challenges derives directly from the level of resources provided. Two management challenges were identified for the FY 2002 reporting period: 1) With regard to financial management, NIST has continued its long record of unqualified audit opinions and remains on track for full deployment of the Commerce Administrative Management System (CAMS); and 2) NIST continues to use information technologies as a strategic tool for increasing program efficiency and effectiveness.

FY 2002 Performance

OTP

In FY 2002, OTP had one goal and three measures, and met its performance targets. In its quest for continual improvement, during FY 2002 OTP reviewed its metrics and outlined a new approach to better evaluate its performance, focusing on activities to be completed. OTP was successful in achieving these goals.

NIST

In 2002, NIST had four goals and fifteen measures. Of the measures, one is qualitative (external expert peer review of the NIST laboratories), and twelve are quantitative. In addition, multi-year retrospective microeconomic impact studies are used for two different goals. Of the twelve quantitative metrics, eight do not have final data for FY 2002 (see text below for detailed descriptions of data collection systems). NIST met the FY 2002 targets set for each of the four quantitative metrics for which FY 2002 data were available.

NTIS

In FY 2002, NTIS had one goal and three measures. Of those three measures, NTIS met all three. This reflects improvements in all reported measures from FY 2001. Implementation of NTIS's new business model which focuses on its mission of disseminating information and stimulating innovation and discovery, thus, supporting economic growth and job creation, has been a major influence on the success of the performance measures.

Targets and Performance Summary

See individual Performance Goal section for further description of each measure.

Performance Goal 1: Promote technology-based growth through partnerships with industry (OTP)

Measure	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
OUTREACH: Engage U.S. industry and the nation's S&T community on salient issues and policy needs.	New	New	New	Activities completed	Activities completed	X	
ANALYSIS/EDUCATION: Prepare timely, value-added analyses and educate policymakers about the nation's resources, competitiveness, and capabilities for R&D and innovation.	New	New	New	Activities completed	Activities completed	X	
ADVOCACY: Advocate policies, programs, and partnerships to promote U.S. innovation and enable technology-led economic growth	New	New	New	Activities completed	Activities completed	X	

Performance Goal 2: Provide Technical Leadership for the Nation's Measurement and Standards Infrastructure and Ensure the Availability of Essential Reference Data and Measurement Capabilities (NIST)

Measure	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Qualitative assessment and performance evaluation using peer review	Completed	Completed	Completed	Complete	Completed	X	
Economic impact studies	Completed	Completed	Completed	Complete	Completed	X	
Standard reference materials available	1,288	1,292	1,335	1,350	1,353	X	
Standard reference data titles available	60	63	65	68	90	X	
Number of items calibrated	3,118	2,969	3,192	2,900	2,924	X	
Technical publications produced[1]	2,270	2,250	2,207	2,050	2,236	X	

Performance Goal 3: Accelerate Technological Innovation and Development of the New Technologies that will Underpin Future Economic Growth (NIST)[2]

Measure	FY 1999 Actual[3]	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Economic impact studies	Completed	Completed	Completed	Complete	Competed	X	
Cumulative # of technologies under commercialization	120	166	195	190	Available in the FY 2003 report		
Cumulative # of publications	468	565	747	770	Available in the FY 2003 report		
Cumulative # of patents filed	607	693	800	930	Available in the FY 2003 report		

Performance Goal 4: Improve the Technological Capability, Productivity and Competitiveness of Small Manufacturers (NIST)[4]

Measure	FY 1999 Actual[5]	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Increased sales attributed to MEP assistance	$425M	$698M	$363M	$726M	Available in the FY 2003 report		
Capital investment attributed to MEP assistance	$576M	$873M	$680M	$910M	Available in the FY 2003 report		
Cost savings attributed to MEP assistance	$364M	$482M	$442M	$497M	Available in the FY 2003 report		

Performance Goal 5: Assist U.S. Businesses and Other Organizations in Continuously Improving their Productivity, Efficiency, and Customer Satisfaction by Adopting Quality and Performance Improvement Practices (NIST)

Measure	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual[6]	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Number of applications per year to Malcolm Baldrige National Quality Award and Baldrige-based state and local quality awards	1,067	911	646	954	Available in the FY 2003 report		
Number of Baldrige Criteria mailed by BNQP and by Baldrige-based state and local quality programs	211,028	176,248	164,949	191,700	Available in the FY 2003 report		

Performance Goal 6: Collect, Organize, Preserve, and Disseminate Government Scientific, Technical, and Business-related Information

Measure	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Number of new items available (annual)	New	New	505,068	510,000	514,129	X	
Number of information products disseminated (annual)	New	New	14,524,307	16,000,000	16,074,862	X	
Customer satisfaction	New	New	97%	97%	98%	X	

[1] *FYs 1999 and 2000 actuals have been adjusted slightly from the previously reported figures due to improved database systems and data verification procedures that have been implemented in recent months.*

[2] *All advanced technology program measures have been updated to include FY 2001 actuals (not previously reported). Based on the President's budget request, all measures assume 35 new awards in FY 2002.*

[3] *FY 1999 actual has been adjusted very slightly from the previously reported figure (from 616 to 607, a 1.5% change) due to data verification improvements made in consultation with an audit team from the Department of Commerce's Office of the Inspector General.*

[4] *FY 2002 actuals are not yet available due to data collection requirements (lag is one year). FY 2001 actuals are reported here for the first time.*

[5] *The FY 1999 actual for "increased sales attributed to MEP assistance" has been adjusted slightly from the previously reported figure (from $447M to $425, a 4.9% change) due to data verification improvements made in consultation with an audit team from the Department of Commerce's Office of the Inspector General.*

[6] *Data based on applications to and Criteria disseminated by BNQP and 41 out of 54 state and local programs.*

Resource Requirements Summary

(Dollars in Millions. Funding amounts reflect total obligations.)
Information Technology (IT)
Full Time Equivalent (FTE)

Performance Goal 1: Promote Technology-based Growth through partnerships with industry (OTP)				
	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Under Secretary (US)/OTP	10.8	7.1	7.8	7.9
Reimbursable	0.2	0.1	0.4	0.2
Total Funding	11.0	7.2	8.2	8.1
IT Funding[1]	0.2	0.4	0.3	0.3
FTE	44	39	40	46

Performance Goal 2: Provide Technical Leadership for the Nation's Measurement and Standards Infrastructure and Ensure the Availability of Essential Reference Data and Measurement Capabilities (NIST)				
	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Scientific and Technical Research & Services				
Electronics and Electrical Engineering	38.5	38.6	40.6	41.5
Manufacturing Engineering	19.1	19.0	18.9	19.4
Chemical Science and Technology	32.0	33.2	34.3	34.3
Physics	29.1	29.8	32.8	34.5
Material Sciences and Engineering	50.0	51.9	54.0	56.0
Building and Fire Research	14.9	15.2	17.6	20.2
Computer Science and Applied Math	42.5	46.5	55.6	56.4
Technology Assistance	17.6	17.8	17.8	18.1
Research Support Activities	31.7	26.2	29.0	44.5
Construction	19.6	200.5	37.7	70.6
Working Capital Fund				
Direct Investments	18.8	23.1	28.5	21.3
Reimbursable	100.5	110.7	115.5	150.6
Total Funding	414.3	612.5	482.3	567.4
IT Funding[1]	48.0	50.2	54.2	66.7
FTE	2,762	2,670	2,594	2719

Performance Goal 3: Accelerate Technological Innovation and Development of the New Technologies that Will Underpin Future Economic Growth (NIST)

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Industrial Technology Services				
Advanced Technology Program	190.3	198.3	175.4	197.8
Working Capital Fund	0.0	0.5	0.4	0.3
Total Funding	190.3	198.8	175.8	198.1
IT Funding[1]	2.8	5.8	4.0	4.0
FTE	271	270	239	254

Performance Goal 4: Improve the Technological Capability, Productivity and Competitiveness of Small Manufacturers (NIST)

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Industrial Technology Services				
Manufacturing Extension Partnership	127.9	103.3	105.9	108.2
Working Capital Fund	3.5	1.1	0.5	0.3
Total Funding	131.4	104.4	106.4	108.5
IT Funding[1]	2.6	2.9	1.5	1.7
FTE	109	91	87	90

Performance Goal 5: Assist U.S. Businesses and Other Organizations in Continuously Improving their Productivity, Efficiency, and Customer Satisfaction by Adopting Quality and Performance Improvement Practices (NIST)

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Scientific and Technical Research and Services				
National Quality Program	3.9	5.3	5.4	4.9
Working Capital Fund	2.3	3.5	1.1	0.1
Total Funding	6.2	8.8	6.5	5.0
IT Funding[1]	0.5	0.7	0.7	0.1
FTE	39	51	49	50

Performance Goal 6: Collect, Organize, Preserve, and Disseminate Government Scientific, Technical, and Business-related Information (NTIS)

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Reimbursable	33.3	38.3	34.7	27.7
Total Funding	33.3	38.3	34.7	27.7
IT Funding[1]	9.9	9.9	9.8	10.7
FTE	322	230	196	186

Discontinued Performance Goal: Protect the National Information Infrastructure (NIST)				
	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Scientific and Technical Research and Services				
Critical Infrastructure Protection Grant Program	N/A	N/A	5.0	0.0
Total Funding	N/A	N/A	5.0	0.0
IT Funding[1]	N/A	N/A	0.0	0.0
FTE	N/A	N/A	2	0

Grand Total	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
OTP	11.0	7.2	8.2	8.1
NIST				
Scientific and Technical Research and Services	279.3	283.5	311.0	329.8
Industrial Technology Services	318.2	301.6	281.3	306.0
Construction	19.6	200.5	37.7	70.6
Working Capital Fund	125.1	138.9	146.0	172.6
NTIS	33.3	38.3	34.7	27.7
Total Funding	786.5	970.0	818.9	914.8
Direct	627.9	792.7	637.8	736.3
Reimbursable[2]	158.6	177.3	181.1	178.5
IT Funding[1]	64.0	69.9	70.5	83.5
FTE	3,547	3,351	3,207	3,345

[1] IT funding is included in total funding; total funding includes direct and reimbursable obligations.
[2] Reimbursable funding includes NIST working capital fund investments.

Skill Summary:

At the end of FY 2002, the staffs of the three component bureaus of TA reflected the following levels of educational attainment:

- Total OTP staff included 11% Ph.D., 22% M.A. or M.S., and 38% B.A. or B.S. holders.
- Total NIST staff included 28% Ph.D., 14% M.A. or M.S., and 18% B.A. or B.S. holders. The breakdown of professional staff by major NIST organization was:
  - NIST laboratories: 54% Ph.D., 19% M.A. or M.S., 18% B.A. or B.S. holders.
  - Advanced technology program: 48% Ph.D., 34% M.A. or M.S., 17% B.A. or B.S. holders.
  - MEP: 5% Ph.D., 64% M.A. or M.S., 27% B.A. or B.S. holders.
  - BNQP: 25% Ph.D., 38% M.A. or M.S., 25% B.A. or B.S. holders.
- Total NTIS staff included 6% M.A. or M.S. and 20% B.A. or B.S. holders.

IT Requirements:

The IT systems NIST operates will continue to shape the ability of its employees to effectively and efficiently accomplish their work and achieve NIST's mission. It is essential that NIST be able to provide an integrated, effective suite of IT resources and services that support current NIST personnel and organizational needs, anticipate the future needs of the organization, and enable NIST to appropriately disseminate information to the public. The efficiency and quality of NIST activities, including technology transfer services and many administrative functions, depend upon seamless, powerful, and highly accessible IT resources. Intramural research programs comprise the bulk of NIST's high-performance, laboratory computing needs and drive its IT strategies. To achieve its IT objectives, NIST must:

- Upgrade computing and communications systems on a regular basis, and focus on high-end computational resources, networking, and electronic information dissemination capabilities; data storage capacity; and security conditions
- Promote interoperability within and across hardware and software platforms
- Provide enhanced management information systems, particularly e-commerce applications for internal systems
- Develop central support for local workstations, and improve user efficiency and system security
- Develop more coordinated and integrated public information dissemination technologies, and keep in mind the Administration's commitment to making government information more easily accessible and useful to the public
- Deploy computer systems security to protect business and scientific information.

FY 2002 Performance Goals

Performance Goal 1 (OTP): Promote technology-based growth through partnerships with industry

Corresponding Strategic Goal

Strategic Goal 2: Provide infrastructure for innovation to enhance American competitiveness.

Rationale for Performance Goal

The Technology Administration's (TA's) Office of Technology Policy (OTP) serves as a key focal point within the federal government for leadership on civilian technology policy. It supports technology-based growth through a range of programs and policy development activities, addressing both domestic and international matters, that work as a whole to identify key policy needs and options, strengthen the capacities for technological innovation by the nation's industry and science and technology (S&T) community, and hasten the transfer of new scientific and technological advances to the private sector for commercial development.

OTP plays an important role in developing and coordinating national technology policy, working in partnership with industry and the S&T community and serving as an advocate for policies that leverage the benefits of new technology and enhance the strength of the nation's economy.

In working to achieve the performance goal, OTP's efforts are focused on general goals (measures) and objectives that will support and improve the U.S.'s innovation system, advance the role technology plays in U.S. economic growth and homeland security, and strengthen the competitive position of U.S. technology industries.

FY 2002 Performance

As a result of continued evaluation of OTP's activities, in the FY 2003 APP/FY 2001 APPR, the single performance measure originally associated with this goal was discontinued in FY 2002 and replaced by a series of key action areas and activities. Those areas and activities are shown as follows with the original performance measure appearing in the discontinued measures section.

For each of the three key action areas, OTP will be pursuing the following action strategies, activities, and performance targets in FY 2002.

1. OUTREACH: Engage U.S. industry and the nation's S&T community on salient issues and policy needs.

Strategies	FY 2002 Activities and Performance Targets	Completed
Facilitate inter- and intra--agency policy discussions, to foster coordinated Administration response to policy issues	• Organize and manage intra- and inter-agency groups to coordinate Administration positions on e-commerce and IT policy issues, technology transfer policies, and emerging technologies.	Yes
Regularly meet with industry leaders for discussion of policy concerns	• Actively participate in stakeholder originated events to solicit information on policy concerns and offer Administration positions.	Yes
Utilize various interactive channels (including the Internet) to disseminate statistical and other analytic information and to dialogue with stakeholders	• Convene meetings with U.S. industry members of TA-led bilateral advisory groups (e.g., Israel, China, Greece/Balkans) to identify policy issues affecting U.S. technology and commercial interests.	Yes
	• Convene meetings with representatives of the APEC Business Advisory Council and the OECD Business and Industry Advisory Committee to obtain business input on policy issues for discussion with the APEC Industrial S&T Working Group and the OECD Innovation and Technology Working Group.	Yes
	• Organize local and field roundtables to identify and discuss stakeholder and Administration perspectives on critical policy issues, such as the U.S. IT workforce, tech-led economic development, e-commerce, and Homeland Defense.	Yes
	• Improve US/OTP's capabilities for electronic communications with customers and stakeholders to solicit views and provide links to U.S. government policy information.	Yes

2. ANALYSIS/EDUCATION: Prepare timely, value-added analyses and educate policymakers about the nation's resources, competitiveness, and capabilities for research and development (R&D) and innovation.

Strategies	Activities and Performance Targets	Completed
Prepare and deliver reports on innovation and technology issues in response to Administration requests, Congressional mandates, and emerging needs	• Complete and deliver the statutory Biennial Report and Annual Report on federal agency tech transfer to the President and Congress.	Yes
	• Complete and deliver the requested report on foreign participation in federal laboratory tech transfer to the White House's Office of Science and Technology Policy (OSTP).	Yes
Disseminate analyses in public forums and through electronic channels, in addition to written documents	• Complete and deliver the congressionally-mandated study of U.S. supply and demand of IT workers.	Draft completed and submitted for review.
	• Prepare annual analysis of the current landscape of U.S. R&D investment.	Yes
	• Initiate studies of U.S. status in development of key emerging technologies.	Yes
Collect, analyze, and disseminate comparative information on the S&T policy strategies of the U.S. and foreign nations	• Develop data on the current tech transfer policies and practices of certain other nations — such as European Union members and Japan.	Yes
Use international expertise to prepare position papers for the White House, DOC, and other senior U.S. government officials meeting with foreign S&T counterparts	• Analyze the technology workforce development practices of certain other nations.	Yes
Develop educational resources and dialogue opportunities for policymakers and stakeholders	• Develop and contribute to regular public events for presentation of facts and perspectives on important policy issues – including biotechnology, international tech transfer practices, workforce and educational issues, and e-commerce.	Yes
	• Create and maintain value-added Web content and information about DOC/TA, industry association, and think tank tech-related policy/strategy papers.	Yes
	• Coordinate outreach and enhance content for the private public GetTech campaign for middle school teachers,students, and parents (in conjunction with the National Association of Manufacturers and other private parties).	Yes

3. ADVOCACY: Advocate policies, programs, and partnerships to promote U.S. innovation and enable technology-led economic growth.

Strategies	Activities and Performance Targets	Completed
Provide Administration and congressional policymakers with policy options concerning U.S. innovation issues	• Work closely with White House staff and other policymakers on current issues related to technology and Homeland Defense.	Yes
Manage the federal Interagency Working Group on Tech Transfer to develop policy recommendations to improve national tech transfer practices Provide information and recommendations on federal tech transfer activities to Congress and the Administration Dialogue with the Federal Laboratory Consortium (FLC), Association of University Technology Managers (AUTM), National Technology Transfer Center (NTTC), industry groups, and others with interests in tech transfer policy issues	• Convene national lab and industry research directors to develop recommendations for improvements in education and outreach at the national labs related to tech transfer.	Yes
Develop and disseminate information to assist state, regional, and local decision makers to support technology-led growth and innovation	• Prepare State Indicators report to provide state leaders with benchmarks and metrics to assess policy progress and impacts. • Award and oversee grants (EPSCOT) for state-originated policy experiments to stimulate tech-led economic growth. • Interact with state, regional, local leaders to identify information needs and disseminate new information. • Manage existing projects analyzing best practices in tech-led economic development and disseminate findings to state/regional/local officials.	Yes Yes Yes Yes
Represent the U.S. government in bilateral and multilateral meetings	• As lead of the U.S. delegation to the semi-annual meetings of the APEC Industrial S&T Working Group, work with other federal agencies to encourage APEC collaboration on critical technology issues. • As U.S. government representative to the semi-annual meetings of the OECD Technology and Innovation Policy Working Group, incorporate U.S. interests in OECD approaches to intellectual property rights protection, business investments in R&D, technology transfer, and workforce mobility. • Represent the U.S. government in ad hoc international technology meetings, such as the Global Business Dialog on e-Commerce. • As lead of the U.S.-Israel Science and Technology Commission, develop and implement bilateral projects (e.g., workshops, training) that advance U.S. technology and commercial interests through cooperation with Israel in biotechnology and information technology.	Yes Yes Yes Yes

Program Evaluation

OTP did not conduct a formal program evaluation for FY 2002.

Performance Goal 2 (NIST): Provide technical leadership for the nation's measurement and standards infrastructure and ensure the availability of essential reference data and measurement capabilities

Corresponding DOC Strategic Goal and Objective

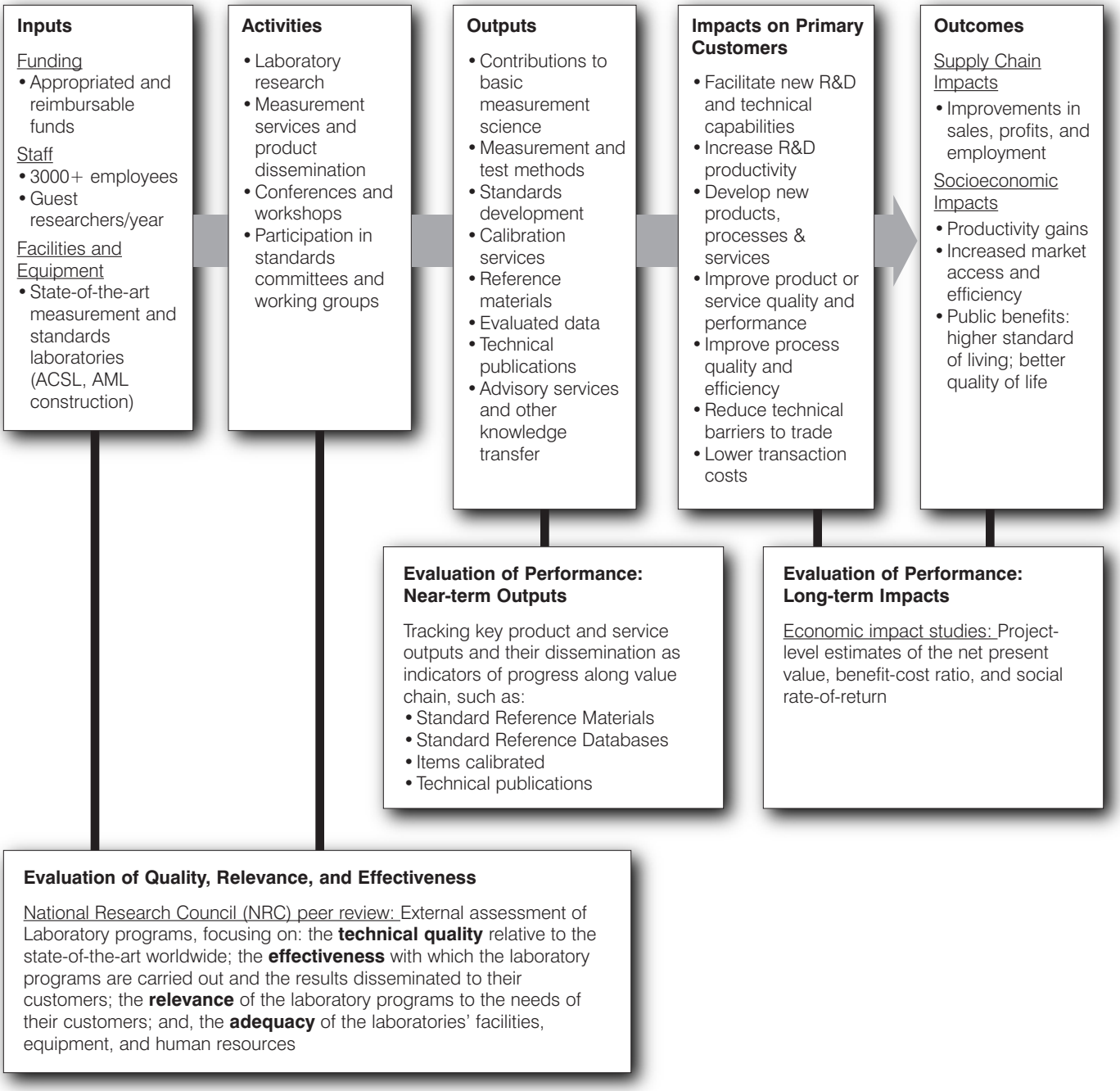
Strategic Goal 2: Provide infrastructure for innovation to enhance American competitiveness.

Rationale for Performance Goal

The NIST Laboratories develop and deliver measurement techniques, reference data, test methods, standards, and other infrastructural technologies and services that provide a foundation for industry in all stages of commerce: research, development, testing, production, and marketing. The NIST Laboratories also support U.S. firms in the global marketplace by working to eliminate trade barriers associated with different national standards, testing, and certification requirements. Since its establishment in 1901 as the National Bureau of Standards, NIST has collaborated closely with industry to anticipate and address the nation's measurement, standards, and technology needs.

The NIST Laboratories perform research to develop the measurement tools, data, and models for advanced science and technology. The model below depicts the NIST Laboratories' value-creation chain — from inputs like funding and staff to outcomes like productivity gains and improved quality of life. The model also includes the evaluation methods and measures used to track progress along the impact path, each of which is described in more detail in the sections that follow.

NIST Laboratories' Impact Path and Evaluation Methods: Results-based Management for Research



NIST has designed its performance evaluation system to accommodate the organization's specific mission and impact path as well as to respond to the intrinsic difficulty of measuring the results of investments in science and technology. Like other Federal science organizations, the primary output of NIST's laboratory research is scientific and technical knowledge, which is inherently difficult to measure directly and comprehensively. In addition, the outcomes from research often do not begin to accrue until several years after the research program has been completed, and the diffusion of benefits often affects broad segments of industry

and society over long time periods. Given these challenges, NIST evaluates its performance against each laboratory strategic goal using a mix, appropriate to each goal, of specific output tracking plus crosscutting peer review and economic impact analyses. Taken together, these evaluation tools, combined with continual feedback from customers, provide NIST management and external stakeholders with a detailed and broad view of NIST's performance toward its long-term goals.

Alignment with the President's Management Agenda R&D Investment Criteria

A key component of the President's Management Agenda involves the development of criteria for evaluating investments in federal R&D programs. As developed to date, the R&D investment criteria center on the evaluation of quality, relevance, and performance. As depicted in the impact and evaluation graphic above, NIST uses a combination of external peer review, output tracking, and retrospective economic impact studies to evaluate quality, relevance, and performance over time. NIST's peer review process is particularly productive, as it is comprehensive and ultimately focused on evaluating the quality, relevance, and effectiveness of NIST's efforts to serve its customers' current and prospective measurement and standards needs.

To evaluate prospective investment choices, NIST has recently completed a long-term strategic plan (NIST 2010) that used a combination of external trend analysis and specific opportunity assessments to identify areas where NIST's measurement, standards, and advisory services are critical to technological advancements that have enormous potential impact on the nation's productivity, trade, and quality of life. Where feasible, NIST also contracts for focused prospective economic analyses that estimate the costs associated with inadequate technical infrastructure in specific markets. Most recently NIST sponsored a study of the software industry, and found that the national annual costs of inadequate infrastructure for software testing ranges from $22.2 to $59.5 billion (more than half of these costs derive from error avoidance and mitigation activities of software users; the remaining costs reflect the additional testing resources that software developers must use due to inadequate testing tools and methods). Prospective studies of this nature are used to help NIST refine its investment choices within specific arenas of potential work.

NIST augments these evaluation methods with continual feedback from customers as well as broad policy and management oversight by the Visiting Committee on Advanced Technology. These mechanisms provide additional means for aligning NIST's work with customer needs and managing its programs in the most effective manner possible.

FY 2002 Performance

In 2002, the NIST Laboratories continued a tradition of high quality and strong performance. The laboratories received a thorough external and independent evaluation by the National Research Council (NRC) Board on Assessment of NIST Programs, which has evaluated NIST on an annual basis since 1959. In 2002, the Board on Assessment report pointed to the consistently high technical quality of the laboratories, the relevance of the laboratories' work to current customer needs, and the strong performance of the laboratories overall. The NRC review, which is summarized below and available online at http://www7.nationalacademies.org/NIST/NIST_reports.html, also pointed to the need for facilities and equipment improvements, and even higher quality planning and long-term human capital management in some areas. In any given year, the transfer of NIST's laboratory research capability and measurement knowledge is indicated generally by its suite of output metrics: standard reference materials, data, calibration services, and technical publications. FY 2002 targets were met for each of these measures.

Measure 2a: Qualitative assessment and performance evaluation using peer review

Since 1959, the NIST Laboratories have been reviewed annually by the NRC. The annual NRC Board on Assessment of NIST Programs review is independent, technically sophisticated, and extensive. The Board consists of approximately 150 scientists and engineers, organized into seven panels (one for each of the seven NIST Laboratories) plus two sub-panels for specialized programs. Panel reviews are reported at the division level (the major organizational unit for the laboratories) and build upon assessments of research processes at the project and program levels.

Each year the lab-specific panels conduct a two- to three-day on-site review of each laboratory's technical quality, paying particular attention to the following factors, as charged by the NIST Director:

- The technical merit / quality of the laboratory programs relative to the state-of-the-art worldwide;
- The effectiveness with which the laboratory programs are carried out and the results disseminated to their customers;
- The relevance of the laboratory programs to the needs of their customers; and
- The ability of its facilities, equipment, and human resources to enable the Laboratories to fulfill their mission and meet their customers' needs.

The NRC panel reports for each laboratory provide the basis for a comprehensive annual peer review report on the NIST Laboratories. As in prior years, the NRC report for FY 2002 provides each laboratory, and NIST as a whole, not only with an external quality assessment, but also with valuable information that it can use for its own performance assessment, planning, and management functions. The tables below provide summary statements for the laboratories, excerpted from NRC's 2002 report. NRC reports are posted online at: http://books.nap.edu.

NIST Scientist Wins Nobel Prize for Discovery of a New State of Matter

NIST's Eric A. Cornell and Carl E. Wieman of the University of Colorado at Boulder won the 2001 Nobel Prize in physics for their creation of an entirely new state of matter called Bose-Einstein condensate (BEC). Cornell and Wieman made the discovery at JILA, a joint research institute operated by NIST and the University of Colorado. The BEC is the coldest known material in the universe, forming only when special laser and magnetic techniques are used to chill atoms to a few hundred billionths of a degree above absolute zero. At these ultra-cold temperatures, the atoms no longer behave as separate particles but instead behave as a giant single atom or molecule. The BEC appears very promising for a wide range of applications including extremely precise time standards, new forms of lithography for making microelectronic devices, and quantum computing.

Sample Statements from NRC Peer Review, FY 2002

Laboratory	
Electronics and Electrical Engineering (EEEL)	"The work under way in the Electronics and Electrical Engineering Laboratory continues to be of the highest technical quality. The impact of the programs on industry and other NIST customers is significant…The panel is pleased with the progress that has been made on strategic planning in the laboratory over the past year. The next step will be strengthening of the links between the laboratory-level plan and the NIST-level plan, as well as between the plans at the laboratory and the division levels…The laboratory has clearly placed increased emphasis on interactions with NIST customers; the panel applauds this outreach effort and has seen the positive impact that these relationships have on project selection and dissemination…The construction of the Advanced Measurement Laboratory at NIST Gaithersburg is a very special opportunity for NIST and EEEL." (p. 1-8).
Manufacturing Engineering (MEL)	"The quality of research in the laboratory is high overall. In general, the staff is highly competent and motivated to have a positive impact on U.S. competitiveness…The panel concurs with the broadening of the Manufacturing Engineering Laboratory mission statement to recognize manufacturing beyond that of discrete parts…MEL has made progress in its strategic and program planning efforts…The panel was impressed with the number of MEL researchers who had received awards and recognition from external organizations…MEL has improved its customer focus…The panel agrees with MEL's matrix management approach as a means to best utilize staff skills to accomplish laboratory objectives…The panel is concerned about the decline in the number of MEL technical staff and its impact on the laboratory's ability to meet its goals and objectives." (pp. 1-8, 1-9, 3-3).
Chemical Science and Technology (CSTL)	"Chemical Science and Technology Laboratory programs continue to have high technical merit overall…Several programs were noteworthy for the use and development of cutting-edge technologies…The panel found CSTL to be very proactive overall in identifying the customers of its work…all projects presented to the panel had a concise statement of the anticipated industrial use. The panel was pleased to see an increased awareness of customer impact…Particularly noteworthy for their relevance and effectiveness are the laboratory's efforts in Standard Reference Materials (SRMs), Standards Reference Databases (SRDs), and international standards activities…The panel is pleased with CSTL efforts in Web-based dissemination and finds that the laboratory's Web-based dissemination continues to improve in utility and effectiveness…" (pp. 1-9, 4-4).
Physics (PL)	"The Physics Laboratory continues its tradition of technical excellence and leadership. The awarding of the 2001 Nobel Prize in Physics to one of the laboratory's staff members is the most obvious evidence of this excellence…The Physics Laboratory reaction to the anthrax attacks of late 2001 was outstanding for its responsiveness to unanticipated national need and for its excellent utilization of established NIST skills and resources… The panel commends the leadership role that the Physics Laboratory is taking in the NIST-wide health care initiative and the strong focus that the laboratory has brought to its efforts in this area in the past year…The panel recommends enhanced efforts to develop interlaboratory collaborations and other partnerships that would help leverage Physics Laboratory resources while more effectively meeting NIST-wide strategic goals." (pp. 1-10).
Materials Science and Engineering (MSEL)	"The Materials Science and Engineering Laboratory continues to field programs of high technical merit and strong relevance and effectiveness…In general, the technical competence of staff members is very high, and their projects often push the state of the art and its applications…The laboratory's output is generally excellent in terms of both quality and quantity…Overall, the panel was pleased with the relevance and effectiveness of MSEL's programs…The panel is concerned that decreasing staff levels put core MSEL competencies at risk and hamper the laboratory's ability to step up to new challenges and priorities…The panel noted in particular that the laboratory is making better use of collaborations both within and outside of NIST…MSEL should seek further opportunities to leverage its human resources through appropriate collaborations…(pp. 1-10, 6-3).
Building and Fire Research (BFRL)	"The panel continues to be impressed by the high quality of scientific and technical work produced in the Building and Fire Research Laboratory. Commendable efforts are made to reach out to a broad variety of laboratory customers, ranging from large construction companies to local firefighting units, from code makers to academic researchers, and from standards committees to the public…The laboratory has taken the first step toward the development of a strategic plan…BFRL's existing expertise and programs have placed it in an excellent position to make many positive contributions to the nation's homeland security efforts…The panel is very supportive of BFRL's ongoing and planned activities [in homeland security] but cautions that it is vital for the laboratory to maintain a balance between short-term investigative work and long-term programs aimed at developing research and applications that are broadly relevant." (pp. 1-10, 1-11).
Information Technology (ITL)	"The technical merit of the work in [the Information Technology Laboratory] remains strong…the panel has been consistently impressed with the technical quality of the work undertaken. The panel also particularly applauds ITL staff's willingness to take on difficult technical challenges…The panel is impressed with the progress that has occurred in strategic planning in the [ITL], particularly in the emergence and acceptance of a framework under which laboratory activities operate…ITL has done a remarkable job of becoming more customer-oriented over the past several years. The panel applauds the laboratory's efforts in outreach and notes that the progress reflects improvement in a whole range of areas, from gathering wider and more useful input to help with project selection to increased dissemination and planning for how customers will utilize NIST results and products." (pp. 1-11, 8-3).

(NRC reports are posted at: http://www7.nationalacademies.org/NIST/NIST_reports.html.)

Measure 2b: Economic Impact Studies

NIST Programs Benefit U.S. Industry and Consumers: the NTRM example

Accurate, real-time monitoring of polluting gases emitted by electric utilities, automobiles and other sources depends heavily on equipment calibration standards made by or traceable to the National Institute of Standards and Technology (NIST). A new study now available from NIST, *The Economic Impact of the Gas-Mixture NIST-Traceable Reference Materials Program* (NIST Planning Report 02-4), found that the gas-mixture NIST-Traceable Reference Materials (NTRM) program—an innovative mechanism for meeting a high demand for standards—returns between $21 and $27 in benefits for every dollar spent, with substantial benefits extending into the future.

The NTRM program was created in the early 1990s by NIST, the U.S. Environmental Protection Agency (EPA), and specialty gas companies to increase the availability of NIST-certified reference materials needed to monitor compliance with environmental regulations. Most EPA regulations for stationary source, mobile source and ambient air monitoring require that measurements be traceable to NIST. Under the program, gas companies manufacture standards according to NIST's technical specifications and submit these mixtures to NIST for certification. (NIST also produces a smaller number of its own gas-mixture Standard Reference Materials, the benefits of which were not evaluated in the study.)

In addition to greatly increasing the supply of gas-mixture standards, the NTRM program, after an initial start-up investment by NIST, minimizes on-going costs to taxpayers because it is now supported by industry fees. According to the study, benefits of the program include reduced measurement uncertainty, helping users of the reference materials to avoid some operations and maintenance costs and reducing credit expenditures in emissions trading (an innovative approach to environmental regulation that is generally believed to reduce total pollution-abatement costs). The program enables NIST to meet the needs of these impacted industries, while freeing up its resources to solve other critical standards issues.

NIST Planning Report 02-4 is available in Adobe Acrobat format from: www.nist.gov/director/prog-ofc/report02-4.pdf.

NIST uses retrospective microeconomic studies to assess the long-term impacts that derive from specific NIST Laboratories' programs or projects. NIST has been conducting economic impact studies on a regular basis since 1992, and initiates two to four new impact studies annually. Impact assessments of NIST's R&D in specific technical areas are conducted by external economic and technical experts contracted by NIST. These studies provide both quantitative estimates and qualitative assessments of the economic impacts resulting from the different types of technology infrastructure that NIST provides to U.S. industry. Quantitative estimates compare project costs with quantitative impact evidence in such areas as productivity, quality, time-to-market, transaction costs, sales, market share, and profits.

NIST impact studies use the same quantitative metrics as industry, typically providing one or more of three metrics: 1) net present value and two efficiency measures; 2) a benefit-cost ratio, which compares the net present value of benefits and costs over the time period being analyzed; and 3) a social (internal) rate of return, which represents the annual percentage rate that would be required to reduce the net present value of the benefit time series to zero (i.e., to yield a benefit-cost ratio of one—the break-even point for a project). Recent impact studies also provide qualitative descriptions of impacts that are significant but difficult to quantify, such as the impact of NIST infratechnologies on R&D strategies and capabilities, organizational efficiency, market access, and effectiveness in working with external actors such as suppliers and standards organizations. Studies conducted over the last five years indicate that NIST outputs generate rates of return on R&D that consistently exceed the estimated average returns on R&D conducted by private industry (see table below).[1]

[1] *Nadiri (National Bureau of Economic Research, 1993) estimates an average 20 to 30 percent private return and an average 50 percent social return on R&D conducted by private industry.*

Economic Impact Studies: Long-term Outcomes of NIST Laboratory Research

Industry: Project	Year	Output	Outcomes	Measures
Chemicals: gas-mixture reference standards	2002	NIST-traceable reference materials	Lower regulatory compliance costs; improve market efficiency	SRR: 221-228%; BCR: 21-27; NPV: $49M to $63M
Communications: security (role-based access control)	2002	Generic technology reference models and security standards	Enable new markets; increase R&D efficiency	SRR: 62%; BCR: 109; NPV: $292M
Electronics: Josephson voltage standard	2001	Standard reference materials	Increase R&D efficiency; increase productivity; enable new markets	SRR: 877; BCR: 5; NPV: $18M
Communications: security (data encryption standards)	2001	Standard conformance test methods/services	Increase R&D efficiency enable new markets	SRR: 267-272%; BCR: 58-145; NPV: $345M-$1.2B
Pharmaceuticals: cholesterol measurement	2000	Standard reference materials	Increase productivity decrease transaction costs	SRR: 154%; BCR: 4.5; NPV: $3.5M
Photonics: laser and fiberoptic power and energy calibration	2000	Calibrations	Increase productivity decrease transaction costs	SRR: 43%-136%; BCR: 3-11; NPV: $48M
Chemicals: SRMs for sulfur in fossil fuels	2000	Standard reference materials	Increase productivity reduce transaction costs	SRR: 1,056%; BCR: 113; NPV: $409M
Semiconductors: software for design automation (IGBT semiconductors)	1999	Software model	Increase R&D efficiency increase productivity	SRR: 76%; BCR: 23; NPV: $10M
Chemicals: alternative refrigerants	1998	Standard reference data	Increase R&D efficiency increase productivity	SRR: 433%; BCR: 4
Materials: phase equilibria for advanced ceramics	1998	Standard reference data	Increase R&D efficiency increase productivity	SRR: 33%; BCR: 10
Materials: thermocouples	1997	Standard reference data (calibration)	Lower transaction costs increase product quality	SRR: 32%; BCR: 3
Pharmaceuticals: radiopharmaceuticals	1997	Standard reference materials	Increase product quality	SRR: 138%; BCR: 97
Photonics: optical detector calibration	1997	Standards and calibration services	Increase productivity	SRR: 72%; BCR: 3

Measures: SRR: social (internal) rate of return; BCR: benefit-cost ratio; NPV: net present value.

Collectively, these studies validate NIST's fundamental impact logic model: they prove, in other words, that the measurement and standards infrastructure provided by NIST generate impacts on R&D productivity, market efficiency, product quality, and other factors—typically at a level that far exceeds the input costs.

Individually, these studies also provide management with a broader range of useful qualitative information on such important factors as the nature of the R&D life cycle in individual industries; the points at which measurement technologies affect R&D, production, and market transactions at different levels of the supply chain; and the modes of potential impact associated with different types of NIST infratechnologies. Additional information about economic impact studies is presented in the table below.

[3] *Social (internal) rate of return represents the annual percentage rate that would be required to reduce the net present value of the benefit time series to zero (i.e., to yield a benefit-cost ratio of one—the break-even point for a project).*

Measure 2c: Standard Reference Materials (SRMs) Available				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	1,315	1,300	1,315	1,350
Actual	1,288	1,292	1,335	1,353
Met/Not Met	Not Met	Not Met	Met	Met

Explanation of Measure

Standard Reference Materials Improving Health Care: Cholesterol Measurements

Diagnosing and treating cardiovascular disease requires accurate measurements of cholesterol and its constituents. Since 1966, NIST has developed and disseminated measurement methods, standards, and Standard Reference Materials (SRMs) needed to assure the accuracy of cholesterol tests. As a result of NIST's work, clinical laboratories and other users have adopted increasingly accurate measurement techniques and have significantly reduced uncertainties in cholesterol measurement results. Due to better measurements, fewer patients have been misdiagnosed, public health has been improved, and health care costs have been lowered significantly. The economic benefits of NIST's Cholesterol Standards Program have been analyzed in an independent study by TASC, Inc. The study covered the period of 1986-1999, and estimated a social rate of return of 154 percent and a benefit-to-cost ratio of 4.5:1 during that timeframe.

The number of Standard Reference Materials (SRMs) available illustrates the breadth of measurements supported by NIST. SRMs are certified for their specific chemical and material properties in the NIST Laboratories. SRMs are the definitive source of measurement traceability in the United States—all measurements using SRMs can be traced to a common and recognized set of basic standards that provides the basis for compatibility of measurements among different laboratories. In addition, as economic exchange has become more global, customers are using SRMs to achieve measurement quality and conformance to process requirements that address both national and international needs for commerce and trade. The data represent a direct count of SRMs available to customers at the close of the fiscal year and are tracked on an ongoing basis by NIST Technology Services. Data provide information on output levels only. There are no obvious replacements for these output tabulations; NIST continues to explore the use of additional metrics that could capture leverage in the secondary market and other factors related to downstream impact. As with other NIST products and services, downstream outcomes are measured through project-specific economic impact studies. The text box at right describes an example of one NIST SRM and its impact.

FY 2002 Performance

Performance on this measure is satisfactory. Over time, NIST projects modest growth in the number of SRMs available, given NIST's strategy of focusing on those SRMs that cannot be produced by secondary laboratories and which have broad and/or high downstream impact. In establishing its out-year projections, the NIST SRM Program monitors, among other things, trends in emerging technologies, new regulations that will depend on SRMs for enforcement, and the reference material needs of other federal agencies.

Measure 2d: Standard Reference Data (SRD) Titles Available				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	62	63	66	68
Actual	60	63	65	90
Met/Not Met	Not Met	Met	Not Met	Met

Explanation of Measure

This measure describes the number of Standard Reference Data (SRD) titles that the NIST Laboratories produce and make available through the NIST Standard Reference Data Program. Standard Reference Databases provide numeric data to scientists and engineers for use in technical problem solving, research, and development. These recommended values are based on data that have been extracted from scientific and technical literature, assessed for reliability, and then evaluated to select the preferred values. The data represent a direct count of available SRD titles and are updated on an ongoing basis by the NIST Standard Reference Data Program. Data provide information on output levels only. There are no obvious replacements for these output tabulations. NIST continues to explore the use of additional metrics that could capture use rates, leverage, and other factors that may provide partial indicators of downstream impact.

FY 2002 Performance

The increase in FY 2002 largely reflects a revised and more accurate tabulation of the SRD titles available. In FY 2002, NIST changed its method for tabulating the databases that it makes available to the public. Prior tabulations did not sufficiently represent the number of discrete databases that are being made available through the Web; in some cases, several distinct databases had been counted as a single database because they are clustered at a single overarching Web address. Out-year estimates from FY 2004 forward will reflect this change in methodology. Historically, NIST has produced two new SRD titles per year. At the same time, NIST also provides numerous upgrades to existing databases. Each year, however, some database titles are eliminated from the NIST catalog. Out-year projections assume modest growth in the total number of SRD titles available. Over time, a larger percentage of these titles will be distributed via the Internet.

Measure 2e: Number of Items Calibrated				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	3,375	3,200	3,100	2,900
Actual	3,118	2,969	3,192	2,924
Met/Not Met	Not Met	Not Met	Met	Met

Explanation of Measure

This measure illustrates the quantity of physical measurement services provided by NIST for its customers, including calibration services, special tests, and Measurement Assurance Programs (MAPs). NIST offers more than 500 different types of physical calibrations in areas as diverse as radiance temperature, surface finish characterization, and impedance. NIST calibration services and special tests are characterizations of particular instruments, devices, and sets of standards with respect to international and national standards. NIST calibration services provide the customer with direct traceability to national and

international primary standards. MAPs are quality control programs for calibrating entire measurement systems. The output data represent a direct count of the number of items external customers sent to NIST for formal calibration services. The data provide information on service output levels only and represent a measure of throughput but not workload per se, as the number of tests and/or the time and calibration effort required can vary substantially across items. As with SRMs and SRD titles, downstream impact is a function of the nature of individual calibration services more than the sheer volume of items calibrated. There are no obvious replacements for these output tabulations. NIST continues to explore complementary metrics that could capture leverage in the secondary market and other factors that may provide partial indicators of downstream impact.

FY 2002 Performance

Performance on this measure is satisfactory. Over time, NIST anticipates a relatively high but slightly declining number of items calibrated. This is in keeping with a long-term trend, over the past several decades, of a decline in the number of items calibrated by NIST. (Despite this long-term trend, individual years may fluctuate slightly, as with the slight increase from FY 2000 to FY 2001, due to the periodicity of multi-year calibration cycles.) This decline is taking place for two reasons. First, extended calibration cycles as well as changing technology and industry mergers continue to reduce the number of artifacts delivered to NIST for calibration. Second, NIST focuses on conducting calibrations that require a direct connection to the national standards, and on improving calibration accuracy in areas where new industry demands are emerging. Through this overall approach NIST can efficiently leverage its primary calibration services to support a broader base of secondary calibrations conducted within the private sector.

Measure 2f: Technical Publications Produced

	FY 1999	FY 2000	FY 2001	FY 2002
Target	2,150	2,450	2,200	2,050
Actual	2,270	2,250	2,207	2,236
Met/Not Met	Met	Not Met	Met	Met

Explanation of Measure

Citation Rates Show High Demand for NIST Technical Publications

Print publications are a major channel through which NIST diffuses the scientific and technical knowledge generated by its staff. For GPRA purposes, NIST reports the number of publications generated by its staff as a partial indicator of the Institute's research output. Of these technical publications produced annually, approximately eighty percent are published externally (such as in scientific journals), while the remaining twenty percent are NIST reports and special publications.

In addition, within the scientific community, citation rates often are used to gather additional information about the demand for or relevance of published research: the cumulative number of citations per publication provides a rough gauge of the level of use and hence "impact" of the publications. NIST has assessed the citation rates for its publications by using data collected by the Institute for Scientific Information (ISI), which has been collecting research publication data for more than forty years and now maintains the most comprehensive source of available publication data for scientific and technical organizations. According to these data, NIST's "relative impact"—that is, the average citation rate per NIST publication relative to ISI's baseline citation rate number for all scientific and technical organizations in its database—from 1981 through 1999 has been consistently above average. These data indicate that NIST consistently produces relevant scientific and technical publications that are cited frequently and hence used quite broadly.

This measure represents the annual number of technical publications generated by the NIST Laboratories staff. The number is a direct count of the number of technical publications approved by the NIST Editorial Review Boards at the Gaithersburg and Boulder sites. NIST uses publications as one of the mechanisms to transfer the results of its research to the U.S. private sector and to other government agencies that need cutting-edge measurements and standards. Many of these publications appear in prestigious scientific journals and withstand peer review by the scientific community. Others appear in technological forums where measurement standards and technologies developed by NIST staff (at times in collaboration with private sector partners) are disseminated. See also text box. Data are updated on an ongoing basis by the NIST Office of Information Services. Data are not adjusted for quality and do not capture impact.

FY 2002 Performance

Performance on this measure is satisfactory. Over time, NIST expects a relatively constant level of high quality publications (approx. 2,000-2,200 per year) by its technical staff. As a result, the forecast level of publications is largely a function of anticipated staff levels, although other factors may contribute to slight fluctuations (such as the nature and specific research findings in any given year, and continuing technological improvements in electronic and print publishing over time).

Performance Goal 3 (NIST): Accelerate technological innovation and development of the new technologies that will underpin future economic growth

Corresponding Strategic Goal

Strategic Goal 2: Provide infrastructure for innovation to enhance American competitiveness.

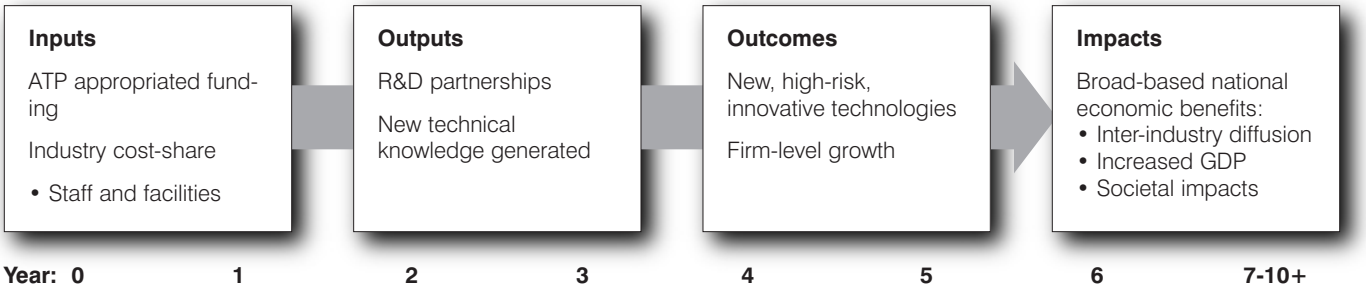
Rationale for Performance Goal

Research and development (R&D) funding in the U.S. has changed profoundly over the last forty years. Once the primary source of funding, the federal government now provides about twenty-six percent of all R&D funds in the U.S., while funds from private industry have expanded from thirty-three percent in 1960 to sixty-eight percent in 2000. The nation's recent economic success and its future prospects depend in large measure on the R&D strategies of private firms.

While the private sector has emerged as the nation's R&D powerhouse, market pressures often deter firms from investing in particular types of technology. Private industry never has accounted for a large percentage of the nation's basic R&D, because firms must be able to appropriate returns within a timeframe and at a level satisfactory to investors. For the same reasons, industry tends to avoid investing in certain types of enabling technologies: infrastructural technologies, which require distinct competencies and are broadly applied; multi-use technologies, which benefit multiple segments of an industry or group of industries; and high-potential breakthrough technologies, which typically involve risk levels and timeframes that far exceed the horizons of individual firms. These areas are the focus of the Advanced Technology Program (ATP): ATP works with industry and academia to identify and promote investment in technologies with significant potential for broad-based economic benefits but inadequate levels of private investment.

The Advanced Technology Program plays a unique role in the nation's R&D infrastructure: it encourages industry to identify and invest resources in high-risk, broad impact technologies—technologies with significant economic and societal promise, but with inadequate levels of private investment.

The Program is designed to generate broad-based economic benefits by stimulating industry-led partnerships to develop new technologies. The ATP uses joint ventures and informal teaming arrangements to combine private investment and the best available scientific and technological talent in industry, universities, and government. The "impact path" for the ATP — from inputs like appropriated funds and industry matching funds to long-term economic benefits — is illustrated below.



From the start of the program, evaluation has been a central part of ATP operations, as a management tool to provide feedback to project selection and program operations, and to demonstrate program results to stakeholders and the public.

The ATP has developed a multi-component evaluation strategy to provide measures of progress and performance at various stages of its impact path: for the short-term, from the time of project selection and over the course of the ATP-funding period (inputs and initial outputs); for the mid-term, as commercial applications are pursued, early products reach the market, and dissemination of knowledge created in the R&D projects occurs (outcomes); and for the longer-term, as more fully-developed technologies diffuse across multiple products and industries, with related net impacts on formation of new industries, job creation, and U.S. economic growth (impacts).

Each of these major stages of ATP's impact path is described below, along with the corresponding performance evaluation methods employed. As appropriate, current performance data (both qualitative and quantitative) are provided, and out-year performance indicators are described.

Outputs

In the early and mid stages of project evolution, ATP tracks key outputs from projects through its Business Reporting System, a unique internal database created in 1993, which draws data from regular, systematic electronic project surveys and supplementary telephone surveys. Key indicators used to represent the generation and diffusion of new commercially-relevant technical knowledge are patents and technical publications generated by ATP-funded projects. Taken together, these two indicators illustrate the generation and diffusion of technical knowledge created by ATP-funded R&D partnerships. The data below indicate ATP's cumulative progress on these two output measures (through FY 2001, the most recent data available).

FY 2002 Performance

Final FY 2002 data for ATP's performance metrics will be reported in the FY 2003 Annual Program Performance Report. In FY 2001, the ATP program met its targets for each of its three quantitative performance metrics. As explained below, these metrics are cumulative and represent performance realized through R&D projects funded over several fiscal years prior to the performance results.

Measure 3a: Economic Impact Studies

Fully successful ATP projects are expected to contribute significantly to the U.S. scientific and technical knowledge base, yield private benefits to the innovators, and ultimately yield benefits to others in the U.S. through market, knowledge, and/or network spillovers. The measurement of long-term economic outcomes requires well-established projects with technological outputs that have been in the market for long time periods. To measure long-term economic impacts that derive from the set of funded ATP projects, the program conducts or contracts detailed and rigorous case studies. Where possible, these studies

also estimate long-term project outcomes. For instance, a recent study of an ATP-funded joint R&D venture for closed cycle air refrigeration technology estimated a social rate of return of at least 83 percent and a benefit-to cost ratio of at least 220:1 (Pelsoci, *Closed-Cycle Air Refrigeration Technology for Cross-Cutting Applications in Food Processing, Volatile Organic Compound Recovery, and Liquid Natural Gas Industries*, GCR 01-819, Dec. 2001). Forthcoming studies include an evaluation of the economic benefits from ATP investments in component-based software and in digital mammography.

Measure 3b: Cumulative Number of Technologies under Commercialization				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	120	170	180	190
Actual	120	166	195	Available in the FY 2003 report
Met/Not Met	Met	Not Met	Met	

Explanation of Measure

The data provide a cumulative direct count of the number of technologies commercialized, as determined through ATP's Business Reporting System. Commercialization is broadly defined as any group of activities undertaken to bring products, services, and processes into commercial applications, including development of commercial prototypes, adoption of processes for in-house production, development of spin-off products and processes, scale-up for volume production, and the sale and licensing of products and services derived from the technology base created by the ATP-funded project.

FY 2002 Performance

For all ATP output metrics, final data for FY 2002 will be reported in the FY 2003 Annual Program Performance Report. FY 2001 performance was satisfactory; the number of technologies commercialized represented 108 percent of the expected level.

Measure 3c: Cumulative Number of Publications				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	480	680	720	770
Actual	468	565	747	Available in the FY 2003 report
Met/Not Met	Not Met	Not Met	Met	

Explanation of Measure

This cumulative count of publications generated by all ATP-funded research through the close of a given fiscal year represents a major channel for the diffusion of technical knowledge that results from ATP funding. Projections are based on extrapolations of past publication rates and projections of projects initiated and completed over time and are updated to reflect all currently available data. These targeting mechanisms are not perfectly accurate for several reasons. The publications data are impacted by delays in ATP project completion and/or project terminations, both of which are difficult to predict years in advance.

In addition, publication rates vary significantly across technology areas. As a result, publications activity will be affected by changes in ATP's completed project portfolio. While these factors and others make perfectly accurate targeting difficult, ATP will continue to track its publications count closely, and also will analyze any trends that may indicate necessary adjustments to its projection models.

FY 2002 Performance

For all ATP output metrics, final data for FY 2002 will be reported in the FY 2003 Annual Program Performance Report. FY 2001 performance was satisfactory; the number of publications produced represented 104 percent of the expected level.

Measure 3d: Cumulative Number of Patents Filed				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	640	770	790	930
Actual	607	693	800	Available in the FY 2003 report
Met/Not Met	Not Met	Not Met	Met	

Explanation of Measure

The third of ATP's set of output measures, these data represent cumulative direct counts of the number of patents filed by all ATP-funded research project participants through the close of a given fiscal year. Projections are based on extrapolations of past patenting rates and projections of projects initiated and completed over time, and are updated to reflect all currently available data. These targeting mechanisms are not perfectly accurate for several reasons. First, the patenting process is difficult to predict, thus, for example, it is possible that patents projected to materialize in one fiscal year might not occur (or be reported) until the following year. Second, the patenting data are impacted by delays in ATP project completion and/or project terminations, both of which are difficult to predict years in advance. In addition, the proclivity to patent varies significantly across technology areas and markets, due in part to differences in the utility and role of intellectual property protection. For example, biotechnology-focused projects may generate more patents than projects of an equivalent size in the IT or manufacturing sectors. As a result, patent activity (like publications) will rise or fall as ATP's completed project portfolio shifts to a different mix of projects. While these factors and others make perfectly accurate targeting difficult, ATP will continue to track its patent count closely, and also will analyze any trends that may indicate necessary adjustments to its projection models.

FY 2002 Performance

For all ATP output metrics, final data for FY 2002 will be reported in the FY 2003 Annual Program Performance Report. FY 2001 performance was satisfactory; the number of patents produced represented 101 percent of the expected level.

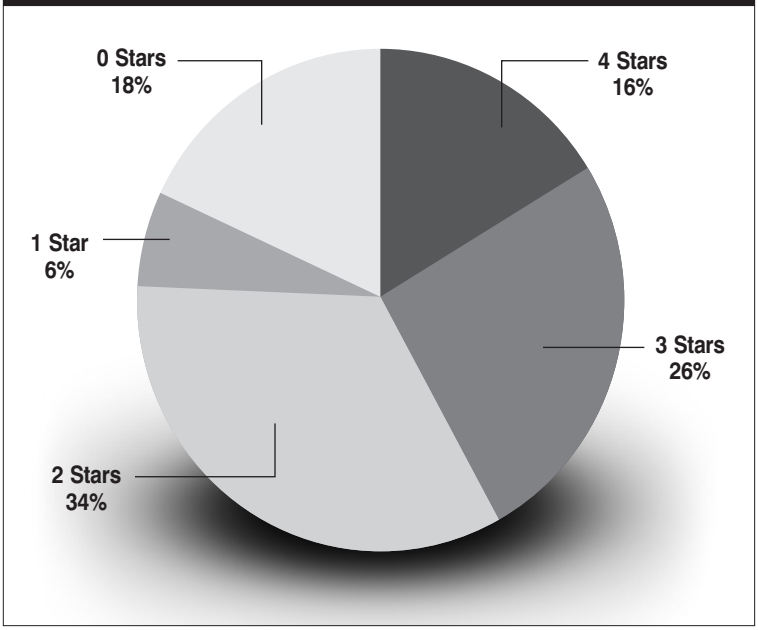
Program Evaluation

To provide a more comprehensive measure of mid-term outcomes from ATP funding, the program recently implemented a Composite Performance Rating System and has compiled and published ratings of the first fifty completed ATP projects. Under the Composite Performance Rating System, each project is scored on a set of measures of knowledge creation, dissemination, and progress toward commercial goals; these are summarized in the table below.

ATP's Composite Performance Rating System: Component Measures of Rating	
Knowledge Creation and Dissemination Measures	**Commercialization Progress Measures**
• Technical awards	• New product/process in market or expected soon
• Collaborations	• Attraction of capital
• Patent filings	• Employment gains
• Publications and presentations	• Business awards
• New product/process in market or expected soon	• Outlook

The results from all these measures are used to construct a composite performance score to indicate the overall project effectiveness against ATP's mission (measured two to three years after the end of ATP funding). The result is a four-star system of ratings, with scores ranging from zero to four stars. The results of this analysis for the first fifty completed ATP projects found that 16 percent of the projects are top-rated in terms of overall project performance, with four stars. Twenty-four percent are in the bottom group of zero or one stars. Sixty percent make up the middle group. Over the next several fiscal years NIST expects to continue evaluating the pipeline of completed ATP projects, applying the rating system to all projects two to three years after they have completed their ATP funding cycle. NIST will include the results of this on-going evaluation in future performance plans and reports.

Results from Composite Performance Ratings
First 50 Completed ATP Projects



Not all ATP projects are fully successful. Given the program's emphasis on funding high-risk, technology development that the private sector is unwilling and unable to fund alone — but which have the potential to result in broad-based benefits for the U.S. economy — dictates that most projects will fail to accomplish all their goals. Some projects are stopped before completion of the funding period. Others fail to meet all their technical goals, or encounter business difficulties before the technologies are commercialized.

Program Evaluation

To supplement its comprehensive internal evaluation methods, the ATP also receives external review and evaluation. The program objectives and management of ATP are reviewed regularly by the Visiting Committee on Advanced Technology (VCAT), a legislatively mandated panel of advisors that meets quarterly to review NIST's general policy organization, budget, and programs, and by the Advanced Technology Program Advisory Committee. The ATP Advisory Committee is charged with: (1) providing advice on ATP programs, plans, and policies; (2) reviewing ATP's efforts to assess the economic impact of the program; (3) reporting on the general health of the program and its effectiveness in achieving its legislatively mandated mission; and (4) functioning solely as an advisory body, in accordance with the provisions of the Federal Advisory Committee Act.

Over the past decade, ATP has been the subject of external reviews focused on program performance, including two broad program reviews by the National Research Council (NRC) Board on Science, Technology, and Economic Policy (STEP). The results of the first NRC review are available in a report entitled *The Advanced Technology Program: Challenges and Opportunities*, published in 1999 and online at http://www.nap.edu/books/0309067758/html/. The second NRC review resulted in a recent report called *The Advanced Technology Program: Assessing Outcomes*, which was published in the summer of 2001 and is available online at http://www.nap.edu/books/030907410X/html/. This most recent evaluation found, among other things, that:

- "…the Advanced Technology Program is an effective Federal partnership program…Its cost-shared, industry-driven approach to funding promising new technological opportunities has shown considerable success in advancing technologies that can contribute to important societal goals such as improved health diagnosis (e.g., breast cancer detection), developing tools to exploit the human genome (e.g., colon cancer protection), and improving the efficiency and competitiveness of U.S. manufacturing" (Summary of Findings, p. 87).

- "The extensive assessments of the program show that it appears to have been successful in achieving its core objective, that is, enabling or facilitating private sector R&D projects of a type, or in an area, where social returns are likely to exceed private returns to private investors" (p. 88).

The report also offers additional findings and a series of recommendations for ATP intended to further improve the effectiveness of the program and to enhance cooperation with other federal and state initiatives.

Most recently, in FY 2002, the Secretary of Commerce conducted and released the results of a comprehensive review of the ATP. The report, called *The Advanced Technology Program: Reform with a Purpose*, may be reviewed online at http://www.atp.nist.gov/atp/secy_rept/. NIST and the ATP are working closely with the Department of Commerce and Congressional stakeholders to analyze and implement the reform proposals contained in this report.

Performance Goal 4 (NIST): Improve the technological capability, productivity and competitiveness of small manufacturers

Corresponding Strategic Goal

Strategic Goal 2: Provide infrastructure for innovation to enhance American competitiveness.

Rationale for Performance Goal

While U.S. manufacturing firms are among the most productive in the world, small manufacturing establishments consistently lag behind their larger counterparts, which are able to apply their greater financial, technical, and human resources to production modernization and continuous performance improvements. But the nation's 361,000 small manufacturers employ approximately twelve million people—about two-thirds of the manufacturing workforce—and produce intermediate parts and equipment that contribute more than half of the value of U.S. manufacturing production. Their role in manufacturing supply chains means that the nation's future manufacturing productivity will rest largely on the ability of these small establishments to improve their quality, raise their efficiency, and lower their costs.

The comparatively low productivity growth of small U.S. manufacturing establishments can be attributed to numerous factors, including technical, cost, and information barriers. NIST helps small manufacturers overcome these barriers through the Manufacturing Extension Partnership (MEP). MEP, a federal-state-local partnership program consisting of a national network of centers and field offices, provides information, decision support, and implementation assistance to help businesses adopt new and more advanced manufacturing technologies, techniques, and business practices. Through an annual client survey, MEP reports on performance measures that track the impact of MEP assistance on several major business indicators, including (1) increased sales attributed to MEP assistance, (2) capital investment attributed to MEP assistance, and (3) cost savings attributed to MEP assistance.

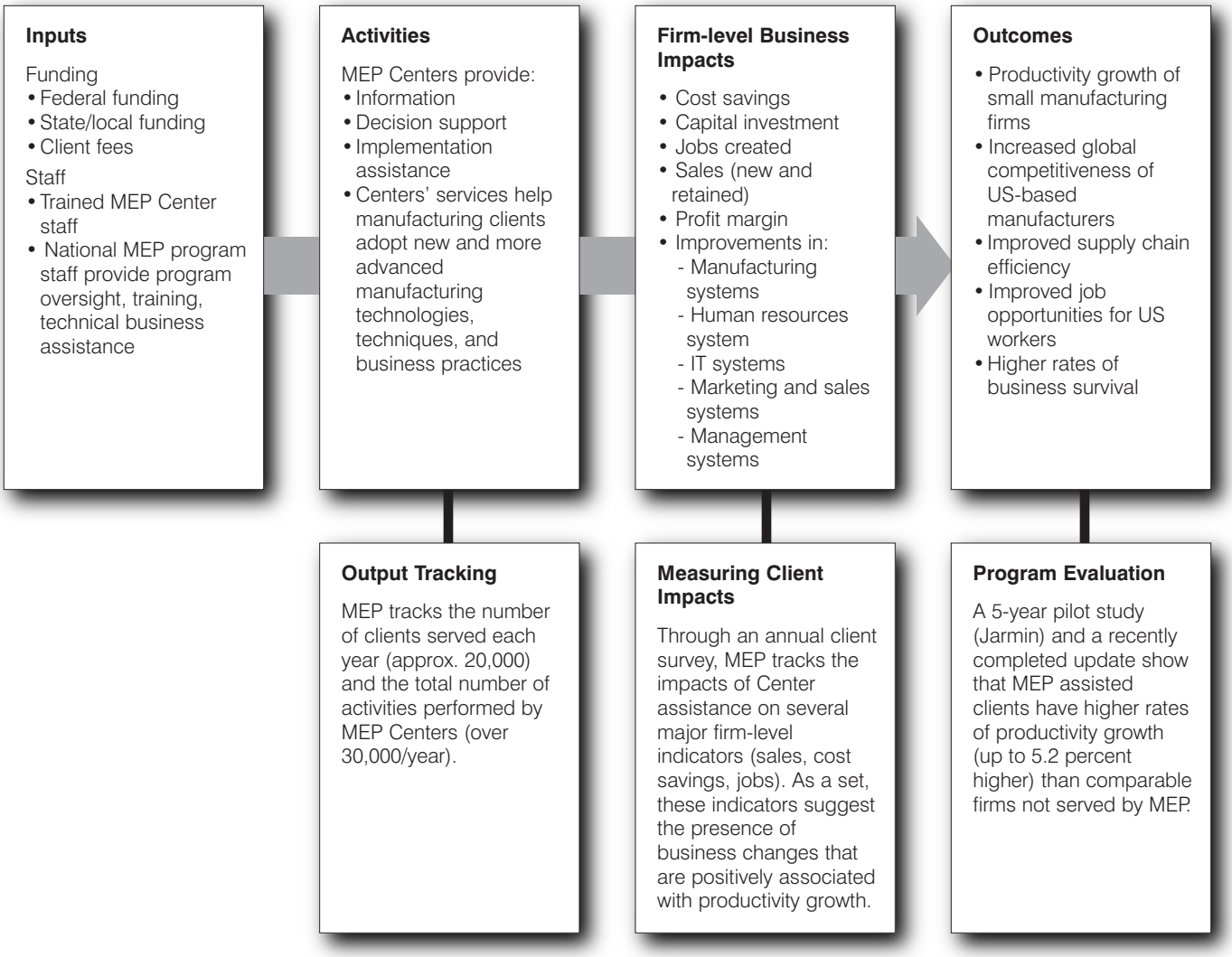
In FY 2000, MEP significantly improved the process by which it evaluates its clients' performance by updating its survey instrument and collection methods. Improvements to the survey design and implementation process have made it more likely that a larger number of surveyed clients will be able to provide quantifiable responses to interview questions. For example, new categories of questions were added to improve data utility, and the wording of the questions was revised to improve accuracy and efficiency. In addition, clients are asked to comment on the impact of MEP services on intermediate outcomes such as improvements in manufacturing, sales/marketing, human resources, information and management systems, and client satisfaction. The survey process is client-based rather than activity-based; it takes a more holistic approach, asking clients to estimate how the entire group of services an MEP Center has provided over the previous two years has affected business performance in the twelve month period prior to the survey date.

Two additional factors should be noted when considering the measures discussed below. First, MEP's data collection and reporting process lags by approximately one year due to the requirements of its surveying procedures; for example, clients who completed a project with MEP in January 2001 were surveyed in early 2002. Second, in the sections that follow, the targets for FY 1999 were computed using the old survey and method. The actual data for FY 1999, FY 2000, and all out-year projections are based on the new survey instrument and process.

MEP Impact: Improving the productivity of small manufacturing establishments

The model below demonstrates the impact path (or value creation chain) of the MEP Program–-from inputs such as appropriated funds and staff to end-outcomes such as productivity improvements for the small manufacturing sector. In addition, the model also depicts how NIST measures the progress of the MEP program along its impact chain.

MEP's Impact Path and Evaluation Methods: Results-based Management for Advisory Services



FY 2002 Performance

Due to data collection requirements (lag is approximately one year), FY 2002 data for MEP output metrics will be reported in the FY 2003 Annual Program Performance Report. Data for FY 2001, which are reported here for the first time, demonstrate the significant client level of outcomes attributable to the program. However, the results for each metric did not meet anticipated targets. These results generally reflect the difficult economic conditions facing small manufacturers during the reporting period: weak demand, slow-to-negative growth, and higher unemployment. FY 2001 figures are based on survey responses from 4,804 clients.

Measure 4a: Increased Sales Attributed to MEP Assistance				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	$443M	$670M	$708M	$726M
Actual	$425M	$698M	$636M	Available in the FY 2003 report
Met/Not Met	Not Met	Met	Not Met	

Measure 4b: Capital investment Attributed to MEP Assistance				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	$359M	$864M	$913M	$910M
Actual	$576M	$873M	$680M	Available in the FY 2003 report
Met/Not Met	Met	Met	Not Met	

Measure 4c: Cost Savings Attributed to MEP Assistance				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	$545M	$576M	$497M
Actual	$364M	$482M	$422M	Available in the FY 2003 report
Met/Not Met		Not Met	Not Met	

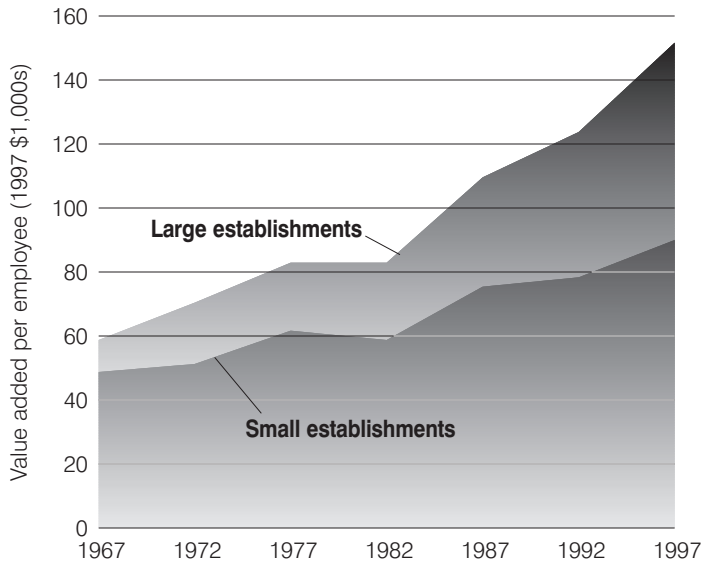
Explanation of Measures

The goal of MEP is to assist small manufacturing establishments overcome barriers to productivity growth by providing information, decision support, and implementation assistance to help those businesses adopt new and more advanced manufacturing technologies, techniques, and business practices. The measures reported above allow MEP to track its activities (number of clients served), and more importantly the *impact* of its services on three key quantitative business indicators that as a set suggest the presence of business changes that are positively associated with productivity and revenue growth: (1) increased sales attributed to MEP assistance, (2) capital investment attributed to MEP assistance, and (3) cost savings attributed to MEP assistance. The measures represent only partial indicators of the impact of the MEP Centers.[1] Many of the benefits of MEP's services are intangible, difficult to quantify, and/or are qualitative in nature.

[1] *Reported data reflect the impact of MEP services primarily on small manufacturing establishments; on some occasions, Centers will elect to serve establishments with over 500 employees. Based on recently compiled survey data, approximately 95 percent of the clients served by MEP are small establishments with fewer than 500 employees; these clients account for approximately 93 percent of the attributed sales impacts.*

Program Evaluation

Labor Productivity by Firm Size



Small manufacturers consistently lag large firms in productivity (see graph). The MEP program provides the types of resources needed by small manufacturing establishments to overcome cost and knowledge barriers to realize productivity growth. The program's progress toward achieving its fundamental objective has been evaluated through rigorous, controlled-comparison studies that evaluate the productivity of MEP-served clients relative to similar companies that did not receive MEP assistance.

A five-year pilot study conducted by R.S. Jarmin of the Center for Economic Studies (U.S. Census Bureau) showed that MEP assisted clients had significantly higher rates of productivity growth than non-MEP clients ($484M in additional value added for client firms).[2] A recently-completed update to this original study (publication forthcoming) also prepared by the Center for Economic Studies found that the average MEP client experienced 5.2 percent higher productivity growth between 1996 and 1997 and 4.7 percent faster employment growth compared to non-MEP clients. The findings cover a larger subset of all MEP clients.

As with other NIST programs, the program objectives and management of MEP are reviewed regularly by the Visiting Committee on Advanced Technology (VCAT), a legislatively mandated panel of advisors that meets quarterly to review NIST's policies, organization, budget, and programs. MEP also is reviewed by its National Advisory Board (MEPNAB), which was established by the Secretary of Commerce in October 1996 and meets three times a year to 1) provide advice on MEP programs, plans, and policies; 2) assess the soundness of MEP plans and strategies; 3) assess current performance against MEP program plans; and 4) function solely in an advisory capacity, and in accordance with the provisions of the Federal Advisory Committee Act. The MEP members bring a variety of backgrounds to the Board, including small and large manufacturing, labor, academia, economic development, consulting, and state government. This mix provides MEP with the outside advice critical to maintaining and enhancing the program's focus on its customers—the U.S.'s smaller manufacturers.

[2] *The benefit-cost ratio compares the net present value of benefits and costs over the time period being analyzed.*

Performance Goal 5 (NIST): Assist U.S. businesses and other organizations in continuously improving their productivity, efficiency, and customer satisfaction by adopting quality and performance improvement practices

Corresponding Strategic Goal

Strategic Goal 2: Provide infrastructure for innovation to enhance American competitiveness.

Rationale for Performance Goal

Quality and performance improvement have become requirements—not options—for competitive businesses and high-performance organizations of all types. Through the Baldrige National Quality Program (BNQP), NIST provides a systematic, well-tested set of business values, performance criteria, and assessment methods that all organizations can use to improve their productivity and effectiveness. Overall, BNQP catalyzes the business community to define what organizations must do to improve their performance and attain (or retain) market leadership, and provides a mechanism for broadly disseminating that information.

FY 2002 Performance

For all National Quality Award output metrics, final data for FY 2002 will be reported in the FY 2003 Annual Program Performance Report. A portion of the discrepancy between target levels and actual performance is due to the difficulties inherent in collecting data from state and local programs. Data from state programs is uneven and can take months to collect. For example, in January 2002, fifty-four state, regional, and local quality award programs were asked to provide information on these and other metrics. Overall, forty-one programs responded and, of these, one program reported that its application information is confidential; six reported that they do not track Baldridge National Quality Program (BNQP) *Criteria for Performance Excellence* distribution or distributed *Criteria* solely through their Web sites; and four indicated that they did not operate an award cycle in 2001. The completeness and timeliness of data generated by state quality programs is difficult to influence. Even with these collection challenges, however, the available data provide a rough proxy for the leveraging effect of the Malcolm Baldridge National Quality Award (MBNQA) on state-level programs. BNQP uses other methods to assess the program's relevance and utility, such as occasional executive surveys and review of anecdotal evidence.

Measure 5a: Number of Applications to the Malcolm Baldrige National Quality Award (MBNQA) and Baldrige-based State and Local Quality Awards

	FY 1999	FY 2000	FY 2001	FY 2002
Target	892	916	935	954
Actual	1,067	911	646	Available in the FY 2003 report
Met/Not Met	Met	Not Met	Not Met	

Measure 5b: Number of Baldrige Criteria Mailed by BNQP and Baldrige-based State and Local Quality Programs				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	203,700	197,600	193,600	191,700
Actual	211,028	176,248	164,949	Available in the FY 2003 report
Met/Not Met	Met	Not Met	Not Met	

Explanation of Measures

Baldrige Criteria: Online Dissemination

In February 2001, the Baldrige National Quality Program began to track the number of times its *Criteria for Performance Excellence* documents were downloaded via the web [http://www.quality.nist.gov]. From February 2001 through the end of the fiscal year, the three types of Baldrige *Criteria* — for business, healthcare, and education — **were downloaded over 400,000 times.** This total demonstrates the very high level of dissemination of the *Criteria*, especially when considered in conjunction with the number of Baldrige documents distributed via mail. However, this count should not be interpreted as the number of distinct users who have read or utilized the documents. It is a direct count of the number of times the documents were downloaded in Adobe Acrobat form. For technical and privacy reasons, it is not possible to determine the number of unique users, if the document was printed, or how long each user spent on the site.

The BNQP reports two key output metrics: (1) the total number of applications to the MBNQA and Baldrige-based state and local awards, which reflects high-level corporate commitment to quality and high-performance business practices throughout the country; and (2) the number of printed BNQP *Criteria for Performance Excellence* documents that are distributed by BNQP and Baldrige-based state and local quality programs, which illustrates the dissemination of BNQP concepts and methods. Both of these metrics illustrate progress on core BNQP objectives: expanding the program itself and promoting the growth of quality awareness and performance excellence throughout the U.S. However, the data are only partial representations of BNQP's output. The application count does not capture the large number of organizations that use Baldrige *Criteria* internally but do not formally apply for MBNQA or state awards. The number of documents mailed also does not capture additional dissemination channels, such as electronic acquisition and dissemination, reproduction of the Baldrige *Criteria* in textbooks, articles, and other documents, and secondary modes of copying and distribution. This is one reason why "number of Baldrige *Criteria* mailed" (measure 6b) indicates a downward trend over time; as more copies of the *Criteria* are distributed via the Internet, the Program expects to mail fewer documents (see text box for additional information about electronic distribution). Moreover, direct counts of Baldrige *Criteria* do not capture various formal and informal ways in which BNQP concepts can be disseminated, such as through academic programs, consulting channels, business and organizational management literature, etc.

Program Evaluation

Economics professors Albert N. Link, of the University of North Carolina, and John T. Scott, of Dartmouth College, recently examined the MBNQA program and estimated the total economic benefits of the program at almost $25 billion, for a benefit-to-cost ratio of 207 to 1. They determined the total operational costs, including the value of executives' volunteered time to review applications, to be $119 million. Through 2000, forty-one companies had received the Baldrige National Quality Award, and NIST had received 785 applications. However, thousands of other organizations of all sizes and in all sectors of the economy have benefited by using the Baldrige *Criteria for Performance Excellence* as the foundation for performance management and quality improvement programs. Thousands of paper and electronic copies of the *Criteria* are disseminated each year to organizations across the country. Professors Link and Scott examined data from a survey of corporate members of the American Society for Quality (ASQ). They estimated the total benefits to the ASQ members from using the *Criteria* to be $2.17 billion. To determine the benefits to the economy as a whole, they extrapolated the ASQ data based on the assumption that other companies in the economy benefit to the same extent as ASQ member companies.

In general, the program objectives and management of the BNQP are reviewed by the Visiting Committee on Advanced Technology (see VCAT information under "External Oversight and Evaluation" of the NIST Laboratories, following Performance Goal 3 above), a legislatively mandated panel of advisors that meets quarterly to review NIST's general policy organization, budget, and programs. In addition, the performance of BNQP is evaluated by the Board of Overseers, a federal panel of national quality experts from business and academia that advises the Secretary of Commerce. An important part of the board's responsibility is to assess how well BNQP is serving the national interest. The board reviews all aspects of BNQP, including the adequacy of the Baldrige *Criteria* and processes for making Baldrige Awards, and reports its recommendations to the Secretary. Other annual external reviews are provided to NIST by the Panel of Judges and the Foundation for the Malcolm Baldrige National Quality Award (MBNQA). See http://www.quality.nist.gov for additional information.

NIST-wide External Program Review and Oversight

The program goals and management policies of NIST as a whole, including each of its major programs, are reviewed regularly by the **Visiting Committee on Advanced Technology (VCAT).** The VCAT is a legislatively mandated panel of external advisors that meets quarterly to review NIST's general policy, organization, budget, and programs. Please refer to the text box for the current list of VCAT members; see also: http://www.nist.gov/director/vcat/index.htm for additional information on the VCAT, including its most recent annual report. As described below, NIST's overall approach to performance measurement consists of three distinct evaluation mechanisms: peer review and other forms of external assessment, economic impact studies, and quantitative output tracking. NIST uses these three evaluation mechanisms as a system that, combined with quarterly VCAT reviews, provides a comprehensive approach to results-based management over time.

NIST Visiting Committee on Advanced Technology (VCAT): Current Membership — 2002

Mr. Gary Floss, Business Partner, Bluefire Partners

Dr. Deborah L. Grubbe, Corporate Director, Safety & Health, DuPont Safety, Health, Environment

Dr. Lloyd R. Harriott, Professor, Dept. of Electrical and Computer Engineering, University of Virginia

Dr. Jennie Hunter-Cevera, President, University of Maryland Biotechnology Institute

Dr. Caroline A. Kovac, Vice President, Services, Applications and Solutions, IBM

Dr. Thomas A. Manuel, President, Council for Chemical Research

Dr. Wayne H. Pitcher, Jr., Technology Management Consultant

Dr. F. Raymond Salemme, Founder, President, and Chief Scientific Officer, 3-Dimensional Pharmaceuticals, Inc.

Dr. Juan M. Sanchez, VCAT Chair, Vice President for Research, University of Texas, Austin

Dr. April M. Schweighart, Product Business Manager, Motorola

Dr. Masayoshi Tomizuka, Director, Engineering Systems Research Center, University of California, Berkeley

Performance Goal 6 (NTIS): Collect, organize, preserve, and disseminate government scientific, technical, and business-related information

Corresponding Strategic Goal

Strategic Goal 2: Provide infrastructure for innovation to enhance American competitiveness.

Rationale for Performance Goal

The National Technical Information Service (NTIS) operates a central clearinghouse of scientific and technical information that is useful to U.S. business and industry. Without appropriated funds, NTIS collects scientific and technical information; catalogs, abstracts, indexes, and permanently archives the information; disseminates products in the forms and formats most useful to its customers; develops electronic and other new media to disseminate information; and provides information processing services to other federal agencies. NTIS's revenue comes from (1) the sale of technical reports to business and industry, schools and universities, state and local government offices, and the public at large and (2) from services to federal agencies that help them communicate more effectively with their employees and constituents.

NTIS continues to meet the challenge of permanent preservation of and ready access to the taxpayers' investment in research and development through the acquisition, organization, and preservation of the titles added annually to the permanent collection. NTIS promotes the development and application of science and technology by providing technologically advanced global e-commerce channels for dissemination of specialized information to business, industry, government, and the public. NTIS is implementing a new initiative to provide the public with increased access to Government information. The NTIS bibliographic database (from 1997 to the present) is available via the Internet free of charge. NTIS allows users to download any item in its collection that NTIS has in electronic format for a single low fee, or at no charge if it is less than twenty pages. In addition NTIS will create links that will hyper-link customers to other agency Web sites that offer documents for free download. These recent developments and initiatives are a result of NTIS' new business model that maximizes utilization of the World Wide Web and e-commerce in its information collection and dissemination activities.

NTIS collects its material primarily from U.S. government agencies, their contractors, and grantees, as well as from international sources. The NTIS permanent collection includes approximately three million titles, including reports describing the results of federally sponsored research, statistical and business information, audiovisual products, computer software, and electronic databases developed by federal agencies, and reports prepared by foreign research organizations. NTIS maintains a permanent repository of these information products as well as offering approximately 500,000 online electronic items to its many customers, primarily researchers and business managers in private industry. The disseminated materials may include computer downloads, paper, microfiche, audiovisual, and electronic media.

Collection of scientific and technical information from various contributors, and dissemination of that information to an even larger audience is highly dependant on external factors and therefore, not entirely controllable. For example, the amount of new material available is highly dependent on budgetary and program decisions made by other agencies. NTIS's efforts to ensure the public easy access to available scientific and technical information through enhanced acquisition and dissemination activities are implemented and monitored through the following performance measures.

FY 2002 Performance

In FY 2002, NTIS had one goal and three measures. Of those measures, NTIS met all three. This reflects improvements in all reported measures from FY 2001. Implementation of NTIS's new business model, which focuses on its mission of disseminating information, stimulating innovation and discovery and thus supporting economic growth and job creation, has been a major influence on the success of the performance measures. NTIS managers will closely monitor the Bureau's performance and remain responsive to necessary changes in the overall operation.

Measure 6a: Number of New Items Available (Annual)				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	New	510,000
Actual			505,068	514,129
Met/Not Met				Met

Explanation of Measure

The number of items available for sale to the public from NTIS includes scientific, technical, and engineering information products added to the permanent collection, as well as items made available through online electronic subscriptions.

Each publication added to the permanent collection is abstracted, catalogued, and indexed so that it can be identified and merged into the permanent bibliographic database for future generations of researchers and the public who may benefit from this valuable research. Other information products are available as full text documents in electronic format through numerous NTIS online information services. This material is acquired primarily from U.S. government agencies, their contractors, and grantees, but also from international sources. NTIS collects approximately 32,000 scientific and technical reports annually and another 482,000 items in the form of articles, updates, advisories, etc. that are contained in various subscription products and databases it distributes. The number of new information products available each year from NTIS is approximately 514,000, but the number largely depends on input from other government agencies.

FY 2002 Performance

NTIS has expanded and refined its efforts to acquire new scientific and technical information products by harvesting products from the World Wide Web. These harvesting efforts together with increased availability of online electronic subscription products demonstrate NTIS' success in making new products available to the public.

Measure 6b: Number of Information Products Disseminated (Annual)				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	New	16,000,000
Actual			14,524,307	16,074,862
Met/Not Met				Met

Explanation of Measure

This measure represents information disseminated and includes compact discs, diskettes, tapes, online subscriptions, web site pages, as well as the traditional paper and microfiche products.

The shift in information dissemination practices from traditional paper copy to electronic-based dissemination has improved NTIS's ability to provide quality products, to increase the number of products distributed, and expand the number of customers that have access to valuable scientific and technical information. NTIS is continually striving to stay abreast of the latest technological advances in information dissemination processes to improve its ability to meet the demands of the public. NTIS has implemented an initiative that enables customers to locate and download information directly from the originating agency's Internet site. NTIS continues to enhance its ability to stay current in the e-commerce environment, while continuing to serve customers that require the more traditional distribution methods, as demonstrated in our targets above.

FY 2002 Performance

Due to recent shifts in information dissemination practices from traditional paper copy to electronic-based dissemination, NTIS implemented a new business model in FY 2002. The new business model was designed to increase information dissemination opportunities by expanding its customer base and increasing demand for its products. NTIS's new business model takes advantage of the opportunities offered by the World Wide Web and its ability to reach large numbers of customers, as demonstrated in the performance measure above.

Measure 6c: Customer Satisfaction

	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	New	97%
Actual			97%	98%
Met/Not Met				Met

Explanation of Measure

This measure represents the percentage of NTIS customers that are satisfied with the quality of their order, the ease of order placement, and the timely processing of that order. Orders for NTIS's vast collection of scientific and technical information are received by phone, fax, mail, and online, and are filled in a variety of formats. NTIS's continual efforts to maintain and possibly improve this very high rate of customer satisfaction are essential to the success of NTIS's performance and mission to collect and disseminate scientific and business-related information.

The percentage of satisfied customers is derived from the number of customer complaints compared to the total number of orders taken. It does not take into account inquires about the status of an order or other general questions.

FY 2002 Performance

NTIS's efforts to ensure customer satisfaction have exceeded expectations for FY 2002. Continued efforts to improve ordering and delivery capabilities have demonstrated success in customer satisfaction.

Program Evaluation

The Office of the Inspector General (OIG) prepared an evaluation of NTIS' new business model. The model reflects NTIS' commitment to maximize dissemination of unclassified scientific, technical, engineering, and business-related information to U.S. business, industry, and the public. The OIG recommendations were: (1) make clear that there are major uncertainties associated with the business model's estimates during future discussions and presentations of the model, (2) periodically review the projections to determine whether they are realistic and achievable, and (3) evaluate the impact of the new business model on NTIS's operations on a monthly basis, and determine whether the new model is achieving the desired results or whether modifications are needed.

TA Data Validation and Verification

NIST's Program Office conducts an annual review of the quantitative performance data to ensure that it is complete and accurate. During this process, Program Office staff discuss the data with appropriate offices to assess results relative to forecasts and to understand long-term trends and drivers of performance. Program Office staff also evaluate the verification and validation procedures used by the offices that provide the source data and verify that the source data itself is identical to or consistent with the reported data. The Commerce Department Inspector General recently audited a set of NIST's quantitative performance measures and associated verification and validation procedures. NIST has implemented the suggestions for improvement identified in that audit.

For its qualitative performance measure, the NIST Program Office provides summary findings from the annual NRC review of the NIST laboratories; the complete results of that evaluation are available for public review. The Program Office also provides the results from economic impact studies, which are conducted by external economists and technical specialists using well-developed research methods and standard economic and business analysis metrics, as specified and monitored by NIST. The TA Data Validation and Verification table can be found starting on the following page.

TA Data Validation and Verification

Performance Measure	Data Source	Frequency	Data Storage	Verification	Data Limitations	Actions to be Taken
Outreach	OTP	OTP performance is cumulative and is reported annually.	OTP	Data represent verifiable tabulations of OTP activities.	Output only	OTP continues to refine this measure.During FY 2003 and FY 2004, it will be integrated into four other measures.
Analysis/Education	OTP	OTP performance is cumulative and is reported annually.	OTP	Data represent verifiable tabulations of OTP activities. For reporting activities, data are gathered and analyzed by technology policy analysts using accepted analytical practices, are submitted for peer review to other DOC bureaus, other agencies, and academia, as appropriate, prior to publication.	Elements of some of OTP's analyses must rely on anecdotal data. Such instances are clearly identified in the reports provided by OTP.	OTP continues to refine this measure. Because it is an integral part of all of OTP's activities and mission, during FY 2003 and FY 2004 this measure will be integrated into four improved measures.
Advocacy	OTP	OTP performance is cumulative and is reported annually.	OTP	Data represent verifiable tabulations of OTP activities.	Output Only	Due to the integral nature of this measure to OTP's activities, in FY 2003 and FY 2004 it will be incorporated and integrated into four improved measures.
Measure 2a: Qualitative assessment and performance evaluation using peer review	On-site interviews and discussions with NIST management and research staff by independent external scientific and technical experts, managed by the NRC.	Annual	NRC	Verification and oversight of laboratory-specific expert review panels provided by the NRC Board on Assessment of NIST Programs.	Data are qualitative in nature.	None
Measure 2b: Economic impact studies	Research is contracted to economic and technical experts, who generate quantitative estimates and qualitative information using performance data gathered through industry surveys and field research. Project cost data are supplied by NIST.	Intermittent	Contractors collect and maintain all data. Survey results, cost data, and all calculations are presented in final reports.	Data are gathered and analyzed by highly qualified economists and technical specialists using well-developed research methods and standard economic and business analysis metrics, as specified and monitored by NIST.	Elements of study populations often are too diffuse to measure; availability and quality of industry data often are uneven; impact estimation typically requires counterfactual data, which can be difficult to estimate; outcomes are specific to each project—i.e., results are not cumulative and not readily comparable.	None
Measure 2c: Standard Reference Materials (SRMs) available	NIST Standard Reference Materials Program.	Ongoing	NIST Standard Reference Materials Program.	Data represent direct and verifiable counts of SRMs available to customers at the close of the fiscal year. Internal verification includes review by NIST Technology Services and the NIST Director's Office and Budget Division.	Data provide information on output levels only.	There are no obvious replacements for these output tabulations; NIST continues to explore the use of additional metrics that could capture leverage in the secondary market and other factors related to downstream impact.

TA Data Validation and Verification *(cont.)*

Performance Measure	Data Source	Frequency	Data Storage	Verification	Data Limitations	Actions to be Taken
Measure 2d: Standard Reference Data (SRD) titles available	NIST Standard Reference Data Program.	Ongoing	NIST Standard Reference Data Program.	Data represent a direct and verifiable count of SRD products developed and disseminated by NIST. Internal verification includes review by NIST Technology Services and the NIST Director's Office and Budget Division.	Output only	There are no obvious replacements for these output tabulations. NIST continues to explore the use of additional metrics that could capture use rates, leverage, and other factors that may provide partial indicators of downstream impact.
Measure 2e: Number of items calibrated	NIST Calibration Program.	Ongoing	NIST Calibration Program.	Data represent direct and verifiable counts of items calibrated by the NIST Laboratories. Internal verification includes review by NIST Technology Services and the NIST Director's Office and Budget Division.	Output only	There are no obvious replacements for these output tabulations. NIST continues to explore complementary metrics that could capture leverage in the secondary market and other factors that may provide partial indicators of downstream impact.
Measure 2f: Technical publications produced	NIST Office of Information Services.	Ongoing	Publications data are gathered and maintained by NIST Office of Information Services.	Data represent direct and verifiable counts of NIST technical publications that have been cleared for publication by the internal Washington and Boulder Editorial Review Boards. Internal verification includes review by the NIST Director's Office. In addition, in the past year database improvements have been made to better track and report publication counts.	Output only	NIST will continue to provide additional information to supplement these output counts, such as providing the breakdown of internal vs. external publications.
Measure 3a: Economic impact studies	Research is contracted to economic and technical experts, who generate quantitative estimates and qualitative information using performance data gathered through industry surveys and field research.	Intermittent	Contractors collect and maintain all data. Survey results, cost data, and calculations are presented in final reports.	Data are gathered and analyzed by highly qualified economists and technical specialists using well-developed research methods and standard economic and business analysis metrics, as specified and monitored by NIST.	Elements of study populations often are too diffuse to measure; availability and quality of industry data often are uneven; impact estimation typically requires counterfactual data, which can be difficult to estimate; outcomes are specific to each project—i.e., results are not cumulative and not readily comparable.	None

TA Data Validation and Verification *(cont.)*

Performance Measure	Data Source	Frequency	Data Storage	Verification	Data Limitations	Actions to be Taken
Measure 3b: Cumulative number of technologies under commercialization **Measure 3c:** Cumulative number of publications **Measure 3d:** Cumulative number of patents filed	Data are gathered from the portfolio of ATP project participants (funded since 1993) through company filings of patent information to the NIST Grants Office (a legal requirement) and an electronic survey instrument under ATP's Business Reporting System (BRS). Separate portfolio-based telephone surveys are conducted of project participants funded prior to 1993 and for post-project data collection.	Annually over the course of ATP funding for projects funded since 1993; intermittent for projects funded prior to 1993; every two years (up to six years) after ATP funding ends.	ATP's Office of Economic Assessment maintains BRS data in an integrated set of databases covering both descriptive information about the funded organizations and survey responses for all participants in ATP-funded research projects.	All ATP reports using Business Reporting System data and patent reports filed through the NIST Grants Office are monitored closely by ATP for research quality and are subject to extensive NIST-wide review and critique prior to being issued. In addition, a recent OIG audit of NIST's performance measures included review of two of these metrics — technologies commercialized and patents filed – and resulted in changes to procedures.	The BRS electronic survey and other telephone survey instruments represent a standardized reporting system. Standard sources of uncertainty include variation in interpretation of specific questions; variation in the estimation techniques used in response to specific questions; variation in the quality of industry data; and missing values.	Administrative procedures have been enacted to increase reliability, per recent DOC IG audit.
Measure 4a: Increased sales attributed to MEP assistance **Measure 4b:** Capital investment attributed to MEP assistance **Measure 4c:** Cost savings attributed to MEP assistance	The MEP client survey instrument was significantly revised in January 2000. The survey is administered by a private firm, Market Facts Incorporated (MFI), located in Arlington Heights, IL.	The survey is conducted four times per year, and clients are selected based on when they completed the first project with an MEP Center in the previous year. For example, a client that completed a project with an MEP Center in February 1999 was surveyed in January/February 2000. This change was implemented to reduce respondent burden, raise overall response rates, and improve data quality. Clients are asked to estimate how the group of MEP-provided services over the previous two years has affected their business performance in the 12-month period prior to the survey date.	Survey data is sent directly to MEP for analysis. MEP reviews and stores survey data received from MFI.	Internal verification includes significant review of the MFI data by MEP staff. Criteria are in place for identifying and verifying significant outliers in the data. In addition, a recent DOC OIG audit of NIST's performance measures included a review of one of MEP's measures ("increased sales attributed to MEP assistance"); in response to this audit, NIST implemented some improvements to data verification procedures.	As with similar survey instruments, sources of uncertainty include variation in interpretation of specific questions; variation in the estimation techniques used in response to specific questions; variation in the quality of industry data; missing values; and other common survey problems. MFI uses standard survey techniques to clean the data, ensure accuracy and reliability, and improve the response rate (which is over 70 percent). Reported data reflect the impact of MEP services primarily on small manufacturing establishments; on some occasions, Centers will elect to serve establishments with over 500 employees. Based on recently compiled survey data (as of mid-2001), approximately 95 percent of the clients served by MEP are small establishments with fewer than 500 employees; these clients account for approximately 93 percent of the attributed sales.	Verification procedures recently improved per DOC OIG audit. Decisions about implementing additional improvements to verification procedures depend on a number of factors including the impact of these changes on MEP's relationships with the Centers and clients, cost, and feasibility.

TA Data Validation and Verification *(cont.)*

Performance Measure	Data Source	Frequency	Data Storage	Verification	Data Limitations	Actions to be Taken
Measure 5a: Number of applications per year to the Malcolm Baldrige National Quality Award (MBNQA) and Baldrige-based state and local quality awards **Measure 5b:** Number of Baldrige Criteria mailed by BNQP and Baldrige-based state and local quality programs	Application data are collected and tracked by the Baldrige National Quality Program; some data collected from state and local programs.	Based on the application cycle. Data from state programs are collected annually.	Baldrige National Quality Program.	Data represent direct and verifiable counts of BNQP business activities and processes. Internal verification includes review by the NIST Director's Office. Data collected from state and local programs may be incomplete.	Output only	NIST will provide additional information to supplement these output counts, such as information about online usage of Baldrige Criteria materials, and will explore possible new or replacement measures. Recently completed assessment of the program provides information on economic impact of the Award program. See below, section on "Program Evaluation."
Measure 6a: Number of new items available (annual)	NTIS operates and maintains internal systems for processing collected information into available products.	Internal management activity reports are produced daily, summaries are produced monthly.	All performance-related information is stored within NTIS systems.	NTIS accounting and budget offices analyze and report performance output data and revenue and cost data to management. Data verification is provided through regular internal ireporting.	None	None
Measure 6b: Number of information products disseminated (annual)	NTIS records every transaction using a commercial order processing system modified to meet its specific needs together with a standard Web analysis software package used by industry.	Internal management activity reports are produced daily, summaries are produced monthly.	All performance-related information is stored within NTIS systems.	NTIS accounting and budget offices analyze and report performance output data and revenue and cost data to management. Data verification is provided through regular internal r reporting.	None	None
Measure 6c: Customer satisfaction	NTIS records every transaction using a commercial order processing system modified to meet its specific needs, together with internal processes for collecting required information.	Internal management activity reports are produced daily, summaries are produced monthly.	All performance-related information is stored within NTIS systems.	NTIS accounting and budget offices analyze and report performance output data and revenue and cost data to management. Data verification is provided through regular internal reporting.	None	None