Forum

Impact of the Government Performance and Results Act

Phillip A. Griffiths

In 1993 Congress passed a law known as the Government Performance and Results Act, whose stated goal is to encourage efficiency, effectiveness, and accountability throughout the federal government. The "Results Act", or GPRA, affects all federal agencies, including those that fund research. The act takes full effect in less than a year, but many mathematicians have heard little about its existence or its likely impact on the research community. I would like to take this opportunity to review the act's brief history and to suggest what the research community might expect from it.

The Committee on Science, Engineering, and Public Policy (COSEPUP) of the National Academies has undertaken a study of the application of GPRA to federal agencies that support science and engineering research. Our report, "Evaluating Federal Research Programs", concludes that the research community, contrary to the opinion of some observers, can conform with both the spirit and letter of the law in ways that are likely to strengthen the nation's research effort.

GPRA applies to all programs funded by the federal government. The focus of the act is on "outcomes", rather than "output". For example, when policymakers evaluate federal funding for an unemployment program, they are interested less in output—such as the number of people who are part of a training program—than in outcome—the number of people who obtain employment as a result of that training program.

From the point of view of the research community, a central challenge of the act is to devise a meaningful way to apply this principle to the evaluation of research programs. It is not easy to measure the outcomes of research every year, especially basic research, and an attempt to do so by purely mechanistic means would fail to carry out the intent of the act. Such an attempt might even distort the research process or produce meaningless data (such as an agency's "Top 100" discoveries of the preceding year). In the field of mathematics it is often difficult to quantify "outcomes" of a long-term line of research on an annual basis. For example, building on the work of a number of mathematicians over a number of years, Wiles's solution of Fermat's Last Theorem required more than seven years of concentrated work, whose success could only be known and described at its conclusion.

After extensive discussions, however, the committee concluded that both basic and applied research programs can be usefully assessed on a regular basis. At the risk of oversimplifying, let me describe how this can be done in two areas. Many of the applied research programs of the mission agencies can be assessed in terms of expected outcomes; in other words, progress toward expected outcomes can be measured annually. For example, if the Department of Energy adopted the goal of producing cheaper solar energy, every year it could measure the results of research directed toward decreasing the cost of solar cells, which is an expected outcome.

For basic research programs, on the other hand, we found that progress also can be documented—by using a different method of assessment. That method needs to be different because of the well-known fact that the ultimate outcomes of basic research are seldom identifiable while the research is in progress.

Let me reinforce this point. History tells us that the benefits to the nation of our investments in basic research are extremely high. History also shows us that basic research often leads to outcomes that were unexpected or took many years to emerge. For example, pre-World War II basic research on atomic structure contributed to the Global Positioning System that now supports navigation systems worldwide and is spreading through the private sector. But attempts to assess a year's worth of that early research would have contained no hint of this particular outcome.

Since we cannot predict ultimate practical outcomes, the committee suggested other means to ensure that research programs generate useful knowledge. We believe that the most effective means of evaluation is a three-pronged process we call "expert review", as follows:

Phillip A. Griffiths is professor of mathematics and director of the Institute for Advanced Study in Princeton, NJ. He is the chair of the committee of the National Academy of Sciences that studied the likely impact of the Government Performance and Results Act on agencies that fund research. His e-mail address is pg@math.ias.edu.

• A quality review looks at the quality of the research being performed. It is best undertaken by reviewers who are expert in the field, an approach traditionally called peer review.

• A relevance review examines whether a research program focuses on the subjects most relevant to an agency's mission. This type of review is undertaken not only by experts in the field but also by potential users and experts in related fields.

• International benchmarking determines whether the research is being performed at the forefront of scientific and technological knowledge. This type of review is best done by national and international experts with sufficient stature and perspective to assess the overall, relative quality of a program.

Expert review involving these elements is already in wide use, both within and outside science. For example, when a congressional committee or a corporate board investigates an issue, it traditionally invites both experts on the issue and a broad representation of people from related fields and the concerned public.

A second concern addressed by COSEPUP is the overlap among agencies of research topics. Our committee concluded that the principle of pluralism in the U.S. research enterprise, by which programs approach important questions from different perspectives, is in fact a major strength. But improvements are still needed. In particular, better communication among agencies is necessary to enhance collaboration, to help keep important questions from being overlooked, and to reduce duplication of effort. The committee recommended the establishment of a formal process to identify and coordinate areas of research that are supported by multiple agencies.

Federal agencies also have a major stake in the production of human resources, and yet not all agencies include human resources as a goal in their strategic plans. The integration of research and education at advanced levels is extremely important to the nation. The committee strongly urges that agencies explicitly adopt the objective of developing and maintaining adequate human capital in science and engineering fields critical to their missions.

A final concern heard by the committee is that the prospect of regular evaluations could be detrimental to the research enterprise. The committee believes that more objective assessments of research programs can only benefit the national research effort, both by focusing resources on the most vital fields and by allocating those resources more effectively. Many researchers already contribute much time and effort to parts of this process by reviewing grant applications, program proposals, and papers submitted for publication, but few of them have heard of GPRA. We believe that the law can become a valuable tool if working scientists and engineers involved in research understand its intention, help educate more people about their work, and lend their expertise to the development of more accurate evaluations.

On behalf of the committee, I would say that this exercise has been a valuable one. The committee has conducted a series of workshops to discuss the act and its implications with the agencies themselves. We believe the act can provide better opportunities for dialog between researchers and funders of research and for demonstrating to the public the enormous value of scientific, engineering, and medical research.

Information Resources on GPRA

There has been extensive discussion of the Government Performance and Results Act (GPRA) within the scientific community, professional societies, and federal agencies. Below are some Web resources that may be useful to readers wishing to learn more.

The Law: The text of the Government Performance and Results Act of 1993 may be found at `http://www.nsf.gov/od/gpra/law.htm`.

NAS Report: In his Forum article, Phillip Griffiths discusses the report about GPRA issued by the Committee on Science, Engineering, and Public Policy (COSEPUP) of the National Academies. The report, *Evaluating Federal Research Programs*, is available through the COSEPUP Web site `http://www2.nas.edu/cosepup/`. See also "National Academy Report on Evaluating Research", *Notices*, June/July 1999, pages 691–692.

NSF: Information about the response of the National Science Foundation (NSF) to GPRA may be found at `http://www.nsf.gov/od/gpraplan/gpraplan.htm` and at `http://www.nsf.gov/od/gpra/start.htm`.

NSF has also issued two reports addressing GPRA and mathematics. In February 1998, the Committee of Visitors of the NSF's Division of Mathematical Sciences (DMS) (Morton Lowengrub, chair) submitted its report, which provides a GPRA assessment for the Division. The report is available at `http://www.nsf.gov/mps/dms/cov98findings.htm`. The DMS response to the report is at `http://www.nsf.gov/mps/dms/cov98reply.htm`. In addition, *Report of the Senior Assessment Panel of the International Assessment of the U.S. Mathematical Sciences*, issued by the DMS in March 1998, came in part as a response to GPRA. The report may be found at `http://www.nsf.gov/pubs/1998/nsf9895/`. See also "Reports Assess U.S. Standing in Mathematics," *Notices*, August 1998, p. 880.

AAAS: The Science and Public Policy Programs of the American Association for the Advancement of Science (AAAS) have monitored developments surrounding GPRA. The AAAS report *1999 AAAS Science and Technology Policy Yearbook* has a number of chapters on GPRA. The report is available online at `http://www.aaas.org/spp/yearbook/`.

GAO Report: A General Accounting Office report on GPRA, entitled *Agencies' Strategic Plans Under GPRA: Key Questions to Facilitate Congressional Review*, is available at `http://www.house.gov/science/gao.html`.

For Taxpayers: The House of Representatives Web page `http://www.house.gov/science/taxpayer.html` discusses what the average taxpayer might want to know about GPRA.

—Allyn Jackson