Audit of Interest in NSF Providing More Research Results

National Science Foundation
Office of Inspector General

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OIG 06-2-013

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Executive Summary

Background: Communicating the results of scientific research is key to furthering science and ensuring accountability for federal research dollars. The websites of federal agencies funding basic research, including the National Science Foundation (NSF), can play an important role in disseminating research results to researchers and other interested constituents. However, NSF has only recently begun planning to provide more research results, in the form of citations of scientific publications resulting from NSF-funded research, on its website.

Purpose: Prior audit work and legislative proposals indicate a public interest in the results of federally funded research. The objective of this audit was to assess the interest among NSF's various constituents for NSF to provide information about the results of the research it funds on its website.

Results in Brief: Recent surveys conducted by the U.S. Government Accountability Office and NSF indicate that NSF constituents have an interest in NSF providing more information about the results of the research it funds. Interviews we conducted with executives of organizations representing NSF's diverse constituents, as well as with NSF program officers, corroborate these results.

The organization executives and NSF program officers expressed an interest in NSF posting more research results, in some format, on its website. They cited multiple advantages to NSF providing this information, such as helping researchers identify possible collaborators and improving the public's understanding of scientific research. While they also expressed some concerns, such as the premature disclosure of proprietary information or an invention, the advantages appear to outweigh the concerns and could be mitigated by NSF's policies and practices.

In terms of the best format to convey the research results, organization executives and NSF program

officers expressed an overwhelming interest in NSF posting brief summaries of research results and publication citations on its website. They also indicated some interest in NSF posting conference proceedings, abstracts of journal articles, and final project reports.

By providing greater public access to the results of the research it funds, NSF would further the public's knowledge and understanding of scientific research, assist researchers in building on prior work, and make its operations more transparent and accountable.

Recommendations: In addition to NSF continuing with its plans to make publication citations available on its website, we recommend that NSF use its positions on various government-wide committees to advocate for the inclusion of brief summaries in project reports. These summaries could then be made available to the public. In addition, we recommend NSF consider posting other formats, such as final project reports, conference proceedings, and/or journal abstracts on its website or providing links to these documents if they are available elsewhere.

Agency Response: NSF agreed with the OIG that access to science is an important issue. We originally recommended that NSF require researchers to submit brief summaries of research results that NSF could then post on its website. However, NSF stated that it would be premature to revise reporting requirements because of government-wide efforts to standardize templates used by researchers to report their results to various federal funding agencies. Accordingly, we modified our report to recommend that NSF use its position on these committees to advocate for brief summaries of research results. NSF agreed with our recommendation to consider posting other forms of results information and is exploring posting journal abstracts or links to these abstracts on the NSF website.

Introduction

Communicating the results of scientific research is key to furthering science and ensuring accountability for federal research dollars. Federal agencies' websites can play an important role in disseminating research results as more of the general public and researchers use the Internet to obtain information about science. By including the results of federally funded research on their websites, agencies provide researchers with access to results across many fields of science and encourage interdisciplinary approaches to research. Access by students, small businesses, and educators could lead to new discoveries and innovations and improve learning. Readily available research results can also inform stakeholders of how public funds are invested, thus increasing agency accountability. Federal agencies have a unique opportunity to provide the scientific community and the public with direct access to information resulting from the research they fund.

Background

Although NSF informs the public about proposed research selected for funding, it does little to publicize the results of individual research projects, other than featuring selected notable discoveries and other scientific highlights on its website. Instead, NSF relies on researchers to disseminate information about their work through peer-reviewed publications and professional conferences. These methods of communication, however, may not reach all parties interested in the work funded by NSF, including educators and students outside the scientific community and policymakers in Congress.

In February 2006 we issued a report on NSF's policies and practices for disseminating the results of the research it funds and recommended NSF provide policymakers and the public with greater access to this information.[1] We recommended that NSF make publication citations available on its website in order to inform the public of publications that resulted from NSF's investment in research. Providing publication citations would make NSF's policy consistent with those of other large federal agencies funding scientific research, such as the National Aeronautics and Space

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[1]National Science Foundation Office of Inspector General, "Audit of NSF's Policies on Public Access to the Results of NSF-Funded Research" (OIG 06-2-004), February 17, 2006.

Administration, the U.S. Department of Energy (DOE), the U.S. Department of Defense (DOD), and the National Institutes of Health (NIH). NSF concurred with this recommendation and has developed an action plan to implement this change.

Our report also noted a general interest in information about the results of federally funded research. For example, the websites of other federal science agencies experience a high volume of use by the public. During fiscal year 2005, the DOE Information Bridge website, which contains research results, had approximately 38 million user transactions. During the same period DOD's Defense Technical Information Center public website, which includes the results of research funded by various DOD research offices, received over 20.3 million hits. NIH's PubMed website received approximately 2.1 million hits per day.

Usage of NSF's website, redesigned in January 2005, has also increased. During calendar year 2005, the website had approximately 500,000 visits per month, and that number increased over 40 percent, to approximately 700,000 visits per month, between January and May 2006. Also, from January to May 2006, the News and Discovery sections of NSF's website, which contain limited results information for select research projects, received over 300,000 page views per month.[2]

With more people accessing federal agencies' websites, Congress is addressing concerns about the public's ability to obtain information on the results of federally-funded research. The recently proposed *Federal Research Public Access Act of 2006* would require federal agencies with extramural research expenditures of over $100 million to make available, via the Internet, an electronic version of published articles whose research has been funded by that agency. Lawmakers expressed hope that this type of access will help accelerate science, innovation, and discovery.

Objectives, Scope, and Methodology

Prior audit work and legislative actions indicate a public interest in the results of federally funded research. As such, the objective of this audit was to assess the interest among NSF's various

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[2] A page view is defined as a request from a visitor's browser for a displayable web page.

constituents for NSF to provide information about the results of the research it funds on its website.

To meet this objective, we analyzed the results of three recent surveys of NSF constituents which reported a general interest in NSF providing more research results directly to the public. In addition, we designed and administered our own questionnaire to assess the views of some of NSF's major constituents on the advantages and concerns of NSF posting eight different research work products on its website. We interviewed the executive director (or designee) of seven national organizations that represented educators, libraries, individual librarians, groups currently underrepresented among NSF-funded researchers (women and minorities), science writers and journalists, and researchers. We also interviewed a random sample of 18 NSF program officers from NSF's 9 directorates and offices to obtain their unique perspective, as both researchers and managers of federal research funds, about the advantages, concerns, and whether NSF should post these 8 research work products.

Finally, we interviewed representatives from both a national and an international organization representing publishers of scientific journals to obtain their opinion on any potential conflicts that might arise from NSF posting the results of its funded research on its website. Details about the questionnaire, surveys, and interviews with organizations and program officers are located in Appendices B, C, D, and E, respectively.

We conducted our audit work between January and June 2006 in accordance with generally accepted government auditing standards.

NSF Constituents Express Interest In More Information on Research Results

Recent surveys indicate that NSF constituents have an interest in NSF providing more information about the results of the research it funds. Interviews with executives representing constituent organizations and NSF program officers corroborated the survey results. By providing more results information on its website, NSF would begin to satisfy this interest and, in doing so, would make its operations more transparent and accountable.

Recent Surveys Indicate an Interest in More Research Results

Three recent surveys of NSF constituents substantiate an interest in federal agencies, and NSF in particular, providing greater access to the results of the research they fund. Specifically, respondents to a survey conducted by the U.S. Government Accountability Office (GAO) and two separate NSF-funded surveys indicated an interest in the results of scientific research (see Appendix C for more information on each survey).

GAO Survey

In 2003, GAO surveyed the sponsored research offices at the 200 universities that received the most federal funding for research and development in fiscal year 2000.[3] The survey specifically asked the offices' views on whether federal grantees' final technical reports should be posted on the public websites of the agencies providing the grants.

Of the 171 offices responding to the survey, 53 percent supported posting final technical reports on agency websites, while only 18 percent were opposed[4]. Although the respondents expressed several concerns, such as users might find the reports incomplete or misleading, or the reports might prematurely disclose research results, they also stated that posting reports could have many benefits. These benefits included facilitating collaboration among scientists, improving scientists' access to research results,

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[3] U.S. Government Accountability Office, "University Research – Most Federal Agencies Need to Better Protect against Financial Conflicts of Interest" (GAO-04-31), November 2003.
[4] Twenty-six percent of the offices were uncertain and 3 percent provided no answer.

establishing a public record of unpublished work, and providing for the prompt dissemination of research results.

NSF Customer Satisfaction Survey

In a survey conducted by NSF, more than 4,000 respondents stated that they would like to have more information on NSF-funded research results. NSF conducted this survey on its website from October 2003 through March 2004, and again from July 2005 through January 2006, to gauge visitors' satisfaction with the website. The survey included questions about who uses the website, how they use it, and what users would like to see added to it. It was offered to 10 percent of the approximately 200,000 website visitors, and the 12,000 respondents included scientists, students, educators, and the general public. When asked what they would like to see more of or see added to the website, respondents most frequently answered "research results."

NSF Website Redesign Survey

Respondents expressed similar interest in research results in another NSF survey conducted between February and March 2004. In this survey, NSF sent emails to over 12,000 people to gather information to aid the agency in designing its new website. The approximately 1,500 survey respondents included members of the public, the media, the research and education community, and a few members of the legislative community. Respondents were asked to select from a list of options as to what type of scientific and engineering information and resources they were most interested in. Over 50 percent said they were interested in summarized information about new discoveries in science. This suggests an interest for research results, relative to the other sorts of resources about which respondents were asked, such as information on funding, grants, events, and profiles of scientists and engineers.

Interviews with NSF Constituents and Program Officers Confirm Interest in More Research Results on NSF's Website

We also interviewed executives from 7 NSF constituent organizations and 18 NSF program officers from across the agency. Similar to the survey responses, all 7 organization executives and all 18 NSF program officers expressed an interest in NSF posting more research results, in one form or another, on its

website. They cited multiple advantages to NSF providing more research results, including providing interested parties direct access to these results, helping researchers identify possible collaborators, improving the public's understanding of scientific research, and facilitating prompt dissemination of research results.

Based on the estimated interest from just the memberships of the seven organizations, NSF could reach tens of thousands of people by providing more research results on its website. Examples of those who could benefit from the information include:

- Freelance science writers, who could use the results to identify and write stories;
- Post-secondary teachers, who could use the information to create lesson plans;
- College and university sponsored research offices, who could use the products to identify who they are competing against for limited research and development funds;
- Women and other minorities in the research community, who could use the information to identify cutting edge areas of research and prepare more competitive proposals; and
- Other researchers, who could use this information to learn about current research in interdisciplinary areas and to determine trends in funding.

The organization executives and NSF program officers also cited some concerns with posting research results, such as the possibility of disseminating incomplete or misleading research and the premature disclosure of proprietary information or an invention. However, these concerns could be effectively mitigated by new or existing NSF policies and practices. For example, NSF could include a statement on its website that it has not verified the completeness or accuracy of the results information provided. In the required formats for submitting research results, NSF could use language similar to its current disclosure for its electronic reporting system that alerts principal investigators submitting project reports not to include any information that could adversely affect an individual's patent rights.

Some also expressed concern that the results information, depending on its format, could be viewed as a publication and, therefore, could hinder researchers' ability to publish articles about their work in scientific journals. To determine the extent to which NSF's posting of research results might affect researchers' relationships with publishers, we interviewed executives at two organizations representing a large number of scholarly journals. They both stated that the publishers they represent are not likely to

view NSF's posting of research results as a violation of publishers' policies that researchers not publish the same results elsewhere. While the organization executives expressed some concern with NSF posting actual journal articles or manuscripts of articles because of copyright and other issues, they both supported NSF posting more research results on its website. As one representative explained, taxpayers have a right to the results of NSF-funded research because they paid for the research, and releasing more research results would allow the public and scientists in different fields to understand the science NSF funds, increase scientific literacy, help policy makers to make decisions, and ensure accountability.

Overwhelming Interest in Brief Summaries and Publication Citations

While everyone we interviewed expressed an interest in NSF providing more research results on its website, organization executives and NSF program officers expressed the most interest and support for NSF posting both brief summaries of research results and publication citations resulting from the research. They also indicated some interest in NSF posting conference proceedings, journal abstracts, and final project reports.

Strong Support for Brief Summaries and Publication Citations

To determine what format NSF should use to meet its constituents' interests in obtaining more research results, we asked the organization executives and NSF program officers to consider eight possible products, each containing the results of NSF-funded research: final project reports, annual project reports, brief summaries of research results, conference proceedings, publication citations, journal abstracts, full text journal articles, and manuscripts of accepted journal articles.

Representatives from all 7 organizations and over two-thirds of the 18 NSF program officers stated NSF should provide the public with brief summaries of the results of NSF-funded research and publication citations. The organization representatives expressed the most support for posting brief summaries while NSF program officers expressed slightly more support for publication citations than brief summaries.

Overall, the organization executives and NSF program officers identified both advantages and concerns for brief summaries and publication citations. These two products would provide the most useful information to meet the needs of NSF's various constituents. Brief summaries appear to have received the strongest support because this format provides a concise means to reach both researchers and the public. The summaries could help researchers identify collaborators and provide for the prompt dissemination of research while, at the same time, improve the public's understanding of research and inform stakeholders about the results of NSF-funded research. Similarly, publication citations could direct researchers to the journal articles while also informing stakeholders about the results of NSF-funded research. The concerns expressed about NSF posting brief summaries and publication citations on its website were generally the same ones mentioned for the other formats and could be addressed by existing or amended NSF policies and practices as discussed earlier.

Some Support for Conference Proceedings, Abstracts, and Final Project Reports

More than half of the organization representatives and about half of the program officers, when asked their perspective as researchers, also supported NSF posting conference proceedings, journal abstracts, and final project reports on its website. However, their interest in these items was not as overwhelming as their interest in posting the brief summaries and publication citations. Further, while almost all of the organization executives supported NSF posting final project reports, more than half of the NSF program officers, when speaking from the perspective of NSF managers, stated that these reports should not be posted.

Those who supported NSF posting conference proceedings, journal abstracts, and final project reports cited advantages to having this information available, such as helping researchers obtain the results of NSF-funded research and identify possible collaborators. They specifically stated final project reports would also provide a mechanism for the prompt dissemination of research results and the dissemination of the results of unpublished research. However, program officers expressed concern about the added costs for NSF personnel to review the reports for content and clarity before they were made available on the website and the lack of peer review for these reports.

Finally, the organizations and program officers expressed little support for NSF posting the remaining items - annual project reports, the full text of published journal articles, and the manuscripts of journal articles accepted by publishers. They stated that the other products, particularly the brief summaries and the publication citations, contain sufficient information on the results of NSF-funded research.

NSF Is Taking Steps, but Can Do More, to Meet Demand for Research Results

In our previous audit on NSF's dissemination policies, we recommended NSF take steps to make more information about the results of the research it funds available to the public.[5] In response, NSF is taking steps to provide more information directly to the public by posting publication citations on its website. NSF agreed that it has a responsibility to provide the scientific community and the public with direct access to information resulting from the research it funds. According to its implementation plan, the agency expects to make the publication citations available to the public by July 2007. However, as our surveys and interviews have demonstrated, NSF's plans to post publication citations only meet part of its constituents' interests identified in this report.

Conclusion and Recommendations

By providing greater public access to the results of NSF-funded research, NSF could further the public's knowledge and understanding of scientific research. Such information could also provide more information for researchers, facilitate locating collaborators, and advance discoveries by allowing others to build on prior research. Additionally, NSF could meet the needs of its wide array of constituents while also providing for accountability and transparency of federal dollars.

As such, we recommend that the Deputy Director, NSF:

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[5] National Science Foundation Office of Inspector General, "Audit of NSF's Policies on Public Access to the Results of NSF-Funded Research" (OIG 06-2-004), February 17, 2006.

1. Ensure NSF uses its positions on various government-wide committees[6] to advocate for the inclusion of brief summaries in progress and final project reports so that NSF could then make the summaries available directly to the public. We suggest that the brief summaries be a part of, or serve as, the accomplishments section included in a project report.

2. Consider posting final project reports, conference proceedings, and/or journal abstracts on its website or providing links to these documents if they are available elsewhere.

Agency Response and OIG Comments

NSF agreed that access to the results of NSF-funded research is important and such access can provide benefits to many of NSF's constituents. However, NSF did not agree with our original Recommendation 1 in which we recommended that NSF post brief summaries of the results of NSF-funded research on the NSF website for every project the agency funds. NSF stated in its response to our draft audit report (see Appendix A) that it would be premature to change reporting requirements for researchers at this time because of other government-wide efforts underway to standardize the templates used by researchers to report their progress to their funding agencies. NSF also cited concerns that these summaries would not be peer reviewed and added that the Office of Legislative and Public Affairs is doing more to disseminate the results of NSF-funded research.

We acknowledge and understand NSF's concern with changing reporting requirements that may be changed again under on-going Federal initiatives. Nevertheless, we believe it is important for NSF to make research results more accessible. We assume that, similar to the proposed standardized annual progress report format, a standardized final project report format would likely include some requirement for the reporting of project accomplishments. These accomplishments, perhaps, can serve the same purpose as brief summaries. Accordingly, we have modified our report to recommend that NSF use its positions on these various

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[6] NSF staff currently serves as members of various government-wide committees considering how to standardize formats for reporting the progress and results of scientific research. These include the Research Progress Report Working Group of the National Science and Technology Council's Research Business Models Subcommittee and the Grants Policy Committee of the Chief Financial Officers Council.

government-wide committees to advocate for the inclusion of brief summaries in project reports. The summaries could then be made available directly to the public. We also hope that these government-wide initiatives will be completed in a timely manner.

NSF agreed with our second recommendation that the agency should consider posting other items, such as journal abstracts, on its website. The agency stated that it is currently formulating plans to explore the option of providing links to the abstracts of journal articles based on NSF-funded research. Appendix A contains the agency's response in full.

Appendix A: Agency Response

MEMORANDUM

Date: August 23, 2006

To: Deborah H. Cureton
            Associate Inspector General for Audit

From: Anthony Arnolie
            Director, Office of Information and Resource Management
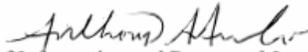
Subject: Requested Response to Draft of Report, Audit of Interest in NSF Providing More
            Research Results, 13 July 2006

Thank you for your memorandum and accompanying draft report dated July 13, 2006. As stated in NSF's response to a previous, related audit (OIG 06-2-004, "Audit of NSF's Policies on Public Access to the Result of NSF-Funded Research"), we agree that public access to and understanding of science is a very important issue.

We applaud the stated goals of the draft report:
- → Further the public's knowledge and understanding of scientific research, and
- → Provide more information for researchers, facilitate locating collaborators, and advance discoveries by encouraging others to build upon prior research.

The draft report has two recommendations:

1. Post brief summaries of the results of NSF-funded research on the NSF Web site for every project the agency funds; and

2. Consider posting final project reports, conference proceedings, and/or journal abstracts on the NSF Web site or provide links to these documents if they are available elsewhere.

Relative to the first recommendation, there is a project currently underway by the National Science and Technology Council's Research Business Models (RBM) Subcommittee to recommend ways to standardize research project reporting across federal agencies. One of the concerns the project hopes to address stems from a recent Faculty Burden Survey of the Federal Demonstration Partnership (FDP), which shows that project reporting is the top task that researchers say takes time away from conducting research. In response to this concern, the RBM initiative has as a secondary goal to recommend a standard template that would help reduce unnecessary reporting while still collecting information that is of value to the agency, including project accomplishments and results. NSF, as an active participant in the Subcommittee, is committed to working with the other agencies to achieve the goal of a flexible but standardized reporting template. In fact, NSF chairs the Research Progress

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Report Working Group that reports to the Subcommittee. Your recommended brief project summaries, written for a general audience, are not currently a part of our project reporting requirements, and we believe it would be premature for NSF to change its procedures prior to the conclusion of the RBM project.

Relative to the second recommendation, NSF has recently been able to increase the amount of information available on our Web site about the results of our funded research. The results of individual research projects are the focus of the majority of the 1,108 news releases, 21 special reports, 12 research overviews, 123 discoveries, and much of the other expanded content currently available on the NSF Web site (http://www.nsf.gov/news/). That expanded content includes a feature, launched in August 2006, to summarize and link to information about NSF-funded research results published on our university and institution partners' Web sites. It is also important for NSF in publishing material on its Web site to ensure that the material has undergone sufficient editing and quality review to ensure its appropriateness for our target audiences, including educators and students outside the scientific community, policymakers in Congress, and the general public. To this end NSF is launching a Foundation-wide effort to produce and make available high-quality summaries of NSF-supported research results that reflect the full portfolio of our many programs.

We agree, following Recommendation 2, that NSF should explore the posting of journal abstracts to the NSF Web site, or providing links to these abstracts if they are available elsewhere. As acknowledged in the draft report, posting or linking to abstracts has many advantages. Journal abstracts undergo peer review, which ensures the quality of the abstracts. Not only would their availability benefit NSF constituents by increasing public access to research results, it would benefit publisher organizations by increasing visibility to their journals and other publications. Linking or posting journal abstracts poses no difficulties for the ongoing interagency project to standardize research reporting. In addition, because the linking or posting of journal abstracts is a natural extension of posting citations to published literature, OIRM has been formulating plans to explore this option.

In conclusion, we are pleased to accept the suggestion in your second recommendation to link with or post published journal abstracts. With regard to the first recommendation, NSF will continue to be a leader in the interagency process to standardize project reporting requirements.

Should you have any additional questions, please contact George Strawn, NSF CIO, (gstrawn@nsf.gov; 703 292 8102).

cc Kathie L. Olsen, Deputy Director
   Fae L. Korsmo, Staff Associate, OD
   George Strawn, Chief Information Officer
   Members, Senior Management's RoundTable

Appendix B: Additional Information on Questionnaires

We interviewed the executive director or designee (organization representative) from seven organizations representing various NSF constituents who may be interested in the results of NSF-funded research. Using a structured interview format, we described possible products containing information about the results of NSF-funded research and then asked if members would use the products if they were posted on NSF's website, how many would use them, and how they would be used. We asked for their opinions about the possible advantages of posting each product as well as their concerns about posting each product. In addition, we asked the organizational representatives whether NSF should post the products discussed, using a scale of 1 to 5, with 1 for definitely yes and 5 for definitely no, and to rank, in priority order, up to four products that they believe NSF should post on its website.

We provided each organization with the following descriptions of eight products NSF could post on its website:

- *Final Project Reports* – NSF currently requires each awardee to submit a final project report to NSF at the end of each project, which includes information such as project activities, results of the project, publication citations resulting from the project, principal investigators' websites, contact information for the principal investigator, and a description of how the research contributes to science.

- *Annual Project Reports* - NSF requires each awardee to submit a project report on an annual basis. These reports contain information similar to final project reports, such as project activities and publication citations. These reports generally contain the progress of the project and interim results as opposed to the final results of the project.

- *Brief Summaries* - Researchers could write brief (e.g. 400 word) overviews of the results of their NSF-funded research. The summaries could also contain names and contact information for the principal investigators.

- *Conference Proceedings* - These materials could include agendas, handouts, summaries of sessions, or other conference materials.

- *Journal Publication Citations* - Publication citations of journal articles resulting from NSF-funded research.

- *Journal Abstracts* - Abstracts of journal articles resulting from NSF-funded research.

- *Full Text Journal Articles* - Journal articles resulting from NSF-funded research.

- *Manuscripts of Accepted Journal Articles*- Similar to the National Institute of Health's policy, the NSF could archive researchers' final, peer-reviewed manuscripts, and post them on its website after the articles are published. Manuscripts are similar to the journal articles, except that they have not gone through the publisher's final formatting and editing.

We asked the organization representatives to state how much of an advantage, ranging from great to none, each of the above products would be in:
- helping their members to obtain information on the latest science research in various fields;
- helping their members to obtain the results of NSF-funded research;
- helping their members to obtain results of unpublished research;
- improving the publics' understanding of scientific research;
- helping scientists to identify possible collaborators; and
- helping to provide prompt dissemination of research results.

We also asked the organization representatives to state how much of a concern, ranging from great to none, it would be that:
- information in these products could be incomplete or misleading;
- research results could be prematurely disclosed;
- an invention could be prematurely disclosed;
- proprietary information could be disclosed;
- posting these products could be viewed as a publication by some journals whose policies prohibit scientists from publishing their results elsewhere;
- products lack peer-review and an editorial process; and
- products would add costs to researchers and institutions who are preparing these products.

For journal citations, abstracts, articles and manuscripts, we asked if the products would duplicate information already available elsewhere, and if the circulation and revenues of traditional journals would decrease. The results of the interviews with each organization are contained in Appendix D.

We also interviewed 18 NSF program officers to obtain their views on the eight research results products. We randomly selected two program officers from each directorate or office and conducted interviews to determine the interest among scientists in each program officer's discipline and among NSF staff to post more research results on the NSF website. Using a structured interview similar to the organizational interviews explained above, we asked program officers, from both their perspective as a researcher and as a manager of a federal research program, whether researchers would use the products, how and why they would use them, and the possible advantages and their concerns with NSF posting these products. We also asked whether NSF should post the products, applying the same 1 to 5 scale of definitely yes to definitely no. Finally, we asked program officers to choose up to four preferred products for posting.

In addition to the advantages we asked the organizations, we asked program officers if these products would:

- help to identify collaborators for cross-discipline research;
- ensure accountability for NSF-funded research;
- improve the quality of final project reports and annual project reports;
- inform various stakeholders about the results of NSF-funded research;
- limit the number of duplicate proposals NSF receives for a given research area; and
- broaden participation in research.

We also asked program officers about additional concerns as to whether these products would add costs to NSF program officers who would review these products and if the products would add additional costs to NSF's infrastructure. A summary of the program officers' interview responses are provided in Appendix E.

Appendix C: Additional Information on Surveys

We obtained and analyzed the results of three surveys related to the interest among NSF's constituents for access to the results of scientific research. The surveys also offered insight into the types of scientific and engineering information in which NSF's constituents are interested.

GAO Survey
In November 2003, the U.S. Government Accountability Office (GAO) issued "*University Research – Most Agencies Better Need to Protect Against Financial Conflicts of Interest"* (GAO-04-31). GAO examined federal agencies' actions to ensure that the results of the university research grants they fund are made available to the public, and to determine whether universities receiving such grants implement policies for identifying and managing possible financial conflicts of interest. The GAO reviewed the actions of 8 federal agencies and conducted a web-based survey of the 200 universities receiving the most federal funding for research and development in fiscal year 2000. They received responses from 171 universities, a response rate of 86 percent. We obtained the survey responses from GAO and independently verified the information.

The survey asked the sponsored research offices at the 200 universities about whether or not posting final project reports was a good idea and their views of four advantages and seven disadvantages of posting grants' final technical reports to federal agencies' websites. The four advantages were: facilitates collaboration among scientists; facilitates the access of other scientists to the research results; provides a public record of the research project for results that are not published; and provides prompt dissemination of research results. They could check all responses that applied. They also could select a response of "There are no advantages."

The seven disadvantages were: added administrative cost of complying with agency's requirements concerning preparation of materials to be posted; an invention could be prematurely disclosed; expose investigators to the possibility of harassment; information in report may be incomplete and/or misleading; posting report on the web could be viewed as "publication" by some journals; proprietary information could be disclosed; and research results could be disclosed. Again, they could check all that applied. They also could select a response of "There are no disadvantages." Respondents were also permitted to write in any additional advantages and disadvantages not included among the selections provided by GAO.

Fifty-three percent of the respondents answered that posting the final reports was probably or definitely a good idea; 26 percent were uncertain; and 18 percent thought it was probably or definitely a bad idea. Three percent did not provide a response. The most frequently cited advantage, cited by 73 percent of the respondents, was that the final project reports would facilitate the access of other

scientists to the research results. The most frequently cited disadvantage, cited by 81 percent of the respondents, was that posting the reports could lead to an invention being prematurely disclosed.

NSF Customer Satisfaction Survey
NSF conducted a web-based customer satisfaction survey from October 7, 2003 to March 31, 2004, and again from July 21, 2005 through January 18, 2006. The survey was offered to 10 percent of visitors to NSF's website. Of the 197,289 surveys offered, NSF received 12,181 responses for an overall response rate of about 6 percent. The survey consisted of a set of standard customer satisfaction questions and a separate set of customized questions designed by the NSF. We obtained the results of the survey from NSF and independently verified the results to the extent possible.

One customized question asked respondents "What would you like to see more of or added?" Respondents were provided with a list of options that included: more discoveries (results of NSF research); more science news; more information about NSF - funded films, TV, etc.; more special reports; and no answer.

The most common answer, given by 33 percent of the respondents, was "Research Results." The wording of this answer choice was changed mid-survey to read "More Discoveries (Results of NSF Research)," to more directly address the "Discoveries" posted on the NSF's new website. However, respondents consistently chose this answer 33 percent of the time throughout the survey in spite of the re-wording.

NSF Website Redesign Survey
NSF conducted an email survey between February and March 2004 to gather information to aid in designing the agency's new website. The survey consisted of questions about the sorts of information and features respondents would like to see on a scientific and engineering website, where and how frequently they look for scientific and engineering information, and the types of scientific and engineering information in which they were most interested. The survey was offered to a group of over 12,000 people selected by a contractor who conducts surveys; 1,528 people provided full responses. Respondents identified themselves as members of the general public (69 percent), the media (13 percent), the research and education community (16 percent), the legislative community (1 percent), or did not identify themselves (1 percent).

Respondents were asked what types of science and engineering information and resources they were most interested in. They could select as many options as applied from a list of different sorts of information, such as detailed new discoveries in science, summarized new discoveries in science, funding information, access to scientists, grant information, science photos, calendars of

events, and profiles of scientists and engineers. The most popular answer was "New Discoveries in Science (summaries)," chosen by 53 percent of the respondents.

Appendix D: Additional Information on Results of Organization Interviews

We interviewed executives or their designees at seven organizations representing NSF constituents to determine whether there is an interest among their members for NSF to post more research results on its website. We also interviewed executives or their designees at two organizations representing publishers of scholarly and scientific journals to obtain their opinion on any potential conflicts that might arise from NSF posting the results of the research it funds on its website. The following sections provide a summary of the results of those interviews.

Summary of Results of Interviews with Constituent Organization

As shown in Table D-1, all organization representatives expressed support for NSF disseminating research results in some form.   Posting brief summaries and publication citations were the most frequently cited means of making this information available to the public. The organization representatives also expressed some support for posting conference proceedings, journal abstracts and final project reports. Few supported NSF posting annual project reports, full text journal articles and manuscripts of journal articles.

Table D-1: Organization representatives' opinions regarding whether or not NSF should post various results formats on its website

	NSF Should Post	NSF Should Not Post	Uncertain
Publication Citations	7[a]	0	0
Brief Summaries	7[a]	0	0
Conference Proceedings	5	1	1
Journal Abstracts	4	0	3
Final Project Reports	6	0	1

[a] Representatives from all seven organizations supported NSF posting publication citations and brief summaries on its website. However, six representatives responded "definitely yes" when asked whether NSF should post brief summaries, while only 4 provided the same response when asked about NSF posting publication citations. Therefore, the representatives expressed more support for brief summaries.

Background Information about Constituent Organizations

Organization Representing Science Writers

The purpose of this organization is to foster and disseminate accurate scientific information to the public, help young science writers, and further science writing. It is comprised of approximately 2,500 members, including members of the print

and broadcast media, public information officers, freelance science writers, and some students.

After considering the advantages and concerns of NSF posting research results, and also recognizing the limits of NSF's resources, the executive's top four formats were brief summaries, abstracts of journal articles, publication citations, and the full text of journal articles. The executive estimated that more than half of the organization's members would use short summaries; about half of the members would use journal articles and abstracts, and all or almost all of the members would use the publication citations.   Given the organization's approximately 2,500 members, about 1,250 people would be interested in accessing this information. According to the executive, freelance science writers, whose ranks are growing, are among those most likely to access the information.

Organization Representing Minority Students

This organization is dedicated to improving the education of minority students, with a special focus on mathematics, science, and engineering. It works to ensure that minority researchers obtain funding, identify mentors, hold conferences, and examine current issues in science. The organization has 20 institutional members consisting of 18 universities, with an enrollment of approximately 100,000, and two science associations.

After considering the advantages and concerns and also recognizing the limits of NSF's resources, the executive ranked posting brief summaries, abstracts of journal articles, final reports, and conference proceedings as the top four format choices. The executive estimated that more than half of the organization's members would use brief summaries; less than half of the members would use abstracts, and about half would use final project reports and conference proceedings. Given the organization's 18 university members serving approximately 100,000 students and two science association members, posting these products would satisfy a need for research results information of a wide and extensive variety of members, and would be a positive contributor to helping the organization achieve its vision and goals.

Organization Representing Women

This organization's mission is to achieve equity and full participation for women in science, mathematics, engineering and technology through networking, information and communication exchange, and advocacy. Its members include nearly 3,000 individuals and institutions in the U.S., including corporations and science associations.

After considering the relevant advantages and concerns, and considering the limits of NSF's resources, the executive stated that NSF should post brief

summaries, conference proceedings, journal citations, and final project reports. The executive estimated that more than half of its members would use brief summaries, journal citations, and final project reports, and almost all would use conference proceedings. Given the current membership of 3,000 individuals and institutions, posting research results would be used by at least 1,500 science professionals and institutions. This would help to broaden participation of an underrepresented group, women, in science and engineering.

Organization Representing Science Educators

The mission of this organization is to promote excellence in science teaching and learning. Its 55,000 members include science teachers and other stakeholders in science education.

After considering the relevant advantages and concerns, the executive stated that NSF should post conference proceedings, brief summaries, journal abstracts and journal citations on its website. The executive estimated that less than half of the organization's members would use conference proceedings and brief summaries, and about half of the members would use abstracts and citations of journal articles. Given the organization's current membership, thousands of members would be interested in accessing any of the four products. Those members who would access the information include secondary and post-secondary school teachers, and they would use the information for their teaching and professional development.

Organization Representing Librarians

This organization is dedicated to enhancing the ability of academic library and information professionals to serve the informational needs of the higher education community and to improve learning, teaching, and research. The organization serves community and junior colleges, colleges, and universities as well as comprehensive and specialized research libraries. Its members include academic librarians and other interested individuals, and membership totals approximately 13,000 individuals.

After considering the advantages and concerns, the organization representative concluded that NSF should post final project reports, annual project reports, summaries, and publication citations resulting from NSF-funded research on the NSF's website. The organization representative estimated that all or almost all of the organization's members would use final project reports, annual project reports, and citations and about half would use the summaries. Therefore, given the current membership, several thousand librarians and informational professions would use the products. Given the more than 3,300 university libraries represented by this organization, college and university faculty,

undergraduates, post doctorates, and even international parties would be users of the information.

Organization Representing Research Libraries

This organization's mission is to influence the changing environment of scholarly communication and the public policies that affect research libraries and the diverse communities they serve. It represents nearly 125 libraries at comprehensive research-intensive institutions in the United States and Canada.

After carefully considering advantages and concerns, the executive concluded that NSF should post manuscripts, full text journal articles, final project reports, and summaries resulting from NSF-funded research. The executive estimated that all or almost all of its members would use each of the four products. The executive stated that the groups most likely to use these products included sponsored research offices, science librarians, college and university faculty, students, staff, researchers, and the public.

Organization Representing Researchers

This international non-profit organization is dedicated to advancing science around the world. It publishes a scientific journal as well as many scientific newsletters, books and reports. Individual membership in this organization is approximately 140,000 and includes scientists, full-time students, educators, policy makers and citizens with an interest in science. In addition, affiliate memberships by other science associations extend the reach of this organization to approximately 10 million.

After considering the advantages and concerns and also recognizing the limits of NSF's resources, the executive's top choices were for NSF to post publication citations, brief summaries, and conference proceedings. The executive estimated that less than half of the membership would use the results because the members primarily rely on other sources, including journals and other websites. Nevertheless, thousands of science researchers and other constituents of this organization would still use these products. The products would be especially useful to younger researchers seeking science ideas and topics for study, educators needing material for classroom instruction, and policy makers assessing agency accountability for funds.

Background Information about Publisher Organizations

Organization Representing International Publishers

This organization is an international trade association for not-for-profit publishers and those who work with them. The organization provides training, conducts research to support advocacy, and develops best practices in publishing. The organization represents a large proportion of the world's scientific journals, representing 360 members in 36 countries and between 9,500 and 10,000 journals.

The executive stated few or none of its publisher members would consider final project reports, annual project reports, or brief summaries posted on NSF's website as being published elsewhere. In addition, the executive stated NSF should post final project reports, annual project reports, brief summaries, publication citations, and journal abstracts on NSF's website. The executive explained that publishers would be delighted if NSF posted publication citations on its website, especially if the citations contained a direct link to the article in the publisher's journal.

Organization Representing Publishers in the United States

With about 150 members, this organization represents the major science publishers, university presses, community and non-profit publishers, and book publishers in the United States. The organization educates members on policy issues related to publishing and conducts outreach and advocacy.

The executive stated few or none of its publisher members would consider brief summaries posted on NSF's website as being published elsewhere. Depending on the timing of when annual project reports or final project reports were posted, either less than half, few, or none of its members would consider them as published elsewhere. In addition, the executive stated NSF should post final project reports, annual project reports, brief summaries, and publication citations on its website. The executive explained that because most publishers place journal abstracts on the Internet for free, NSF should place citations on its websites containing information that would provide a link from the NSF website to the abstracts.

Appendix E: Additional Information on Results of Program Officer Interviews

We interviewed NSF program officers to determine from their perspective, as both researchers and managers of federal research programs, whether there is an interest for NSF to post more research results on its website. The following section provides a summary of the results of the interviews with program officers.

As shown in Table E-1, a majority of NSF program officers, as researchers, expressed interest in NSF disseminating more information on research results. They expressed the most support for using brief summaries and publication citations as the vehicle to disseminate this information, but also expressed some support for posting conference proceedings, journal abstracts and final project reports. Few supported NSF posting annual project reports, full text journal articles, or manuscripts of journal articles.

Table E-1: Opinions of NSF program officers, from the perspective of researchers, regarding whether or not NSF should post the following results formats on its website

	Should Post	Should Not Post	Uncertain
Publication Citations	17	0	1
Brief Summaries	15	2	1
Conference Proceedings	11	6	1
Journal Abstracts	11	6	1
Final Project Reports	9	8	1

As shown in Table E-2, the NSF program officers, as federal program managers, still expressed strong support for posting brief summaries and publication citations, but expressed less support for conference proceedings, journal abstracts, and final project reports. Again, few supported NSF posting annual project reports, full text journal articles and manuscripts of journal articles.

Table E-2: Opinions of NSF program officers, from the perspective of federal program managers, regarding whether or not NSF should post the following results formats on its website

	Should Post	Should Not Post	Uncertain
Publication Citations	17	0	1
Brief Summaries	13	4	1
Conference Proceedings	8	6	4
Journal Abstracts	10	7	1
Final Project Reports	7	10	1