NSF Office of Advanced Cyberinfrastructure (OAC)
Committee of Visitors
August 2022

OAC Management Response
April 18, 2023

Introduction

The Office of Advanced Cyberinfrastructure (OAC) in the Directorate for Computer & Information Science & Engineering (CISE) at the National Science Foundation (NSF) held a Committee of Visitors (COV) meeting on August 8-9, 2022. NSF relies on the guidance of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. Committee of Visitor (COV) reviews provide NSF with external expert guidance in two broad criteria: (1) assessments of the quality and integrity of program operations and program-level technical and managerial issues pertaining to proposal decisions; and (2) review of portfolio balance. As stated in NSF's guidance, *"COVs should not be used for outcome assessment and evaluation of the outcomes or long-term impacts of program investments."* The four-year scope of the study was Fiscal Years 2017-2020, and the COV was charged to consider the performance of the office in four primary areas:
  • The quality and integrity of the merit review process within OAC;
  • The selection of reviewers;
  • The management of the programs under review; and
  • The resulting portfolio of awards.
In addition, the COV was asked to identify themes that could be beneficial to cyberinfrastructure across all areas of science that could enhance the office's ability to deliver on its mission.

The COV followed the report template as stated in the charter, but identified five high-level recommendations that incorporated guidance across these areas. OAC management has retained this five-recommendation structure in this response, but has also provided a crosswalk to the more detailed sections of the report template.

Prior to initiating planning for the COV, both the Office Director and Deputy Office Director attended COV training to ensure compliance with Conflict of Interest (COI) policies, COV membership, use of the COV module in eJacket, and general guidance concerning preparation for the review.

OAC notes that there had been substantial growth in the number of proposals handled by OAC programs between the two most recent COV reviews. For the prior COV (held November 28-30, 2017, covering Fiscal Years 2013-2016) the total number of actions for all of OAC during the period under review was 1787 actions. For the 2022 COV, the total number of actions during the period covered was 4397 actions – a 146% increase.

To continue to provide similar levels of COV oversight, the following actions were taken in preparation for the 2022 COV:
  • The number of participating COV members was increased. The prior (2017) COV had six members; the 2022 COV included twelve members.
  • OAC used this Committee of Visitors session as an opportunity to introduce and evaluate a number of new organizational and software-based capabilities as part of the COV process, with the goal of creating a capability that the Foundation could use to easily support future COVs.

Examples of the tools that were piloted during this COV include:

- Incorporation of capabilities from the Power BI data visualization tool within the Microsoft 365 suite, which is currently being tested by the NSF Division of Information Systems. Use of this tool provided external COV members with the ability to see the historical data needed to evaluate the Office of Advanced Cyberinfrastructure's merit review process.
- Creation of an interactive Data Book that followed the NSF COV template, designed to allow COV members to easily navigate through the COV template while viewing relevant data needed to aid the members in answering the questions in the template.
- Establishment of a SharePoint-based portal containing numerous background documents and guidance on relevant NSF policies and procedures. Other background materials provided included a description of the merit review process, a description of the technical architecture that supports the merit review and award management processes, and discussions of NSF administrative data.

In addition, a series of webinars were scheduled prior to the on-site meeting, to resolve any outstanding COI concerns, and to familiarize COV members with the materials, the COV modules, and the NSF award management system itself. The first webinar included presentations from the OAC Office Director and Deputy Office Director summarizing the the mission and vision of the Office as well as each of the five program areas in the office --- High-Performance Computing, Networking and Cybersecurity, Data and Software, Learning and Workforce Development, and Special Projects. The OAC Staff Associate for Operations provided an overview of the prototype interactive data workbook that would now allow external Committee of Visitor (COV) members to view relevant data from the multiple sources needed to answer questions in the template.

The COV scheduled monthly telecons between an April orientation session and the in-person COV in August; this allowed members to begin by reviewing the sample jackets they had been assigned, but later sessions allowed the reviewers to collaborate in small program-specific teams, and then to coordinate insights across all five program areas. This schedule allowed the COV to develop a rough draft of insights and discussion topics in preparation for the COV meeting, which took place in August 2022.

On 8-9 August 2022, the COV convened at the National Science Foundation, to meet with the CISE Assistant Director, OAC leadership, OAC program officers and staff, and to prepare the final report.

On September 19, 2022, the COV reported its findings and recommendations to the Advisory Committee for Cyberinfrastructure (ACCI). The ACCI accepted the COV report. The COV Chair complimented OAC on the thoroughness of the preparations and supporting materials, including the in-person briefings as well as the website:

> *I wanted to emphasize and share that the COV was unanimous that OAC was operating extremely well, from the leadership to the program officers, through all of the decisions that were made, and the professionalism of the staff involved with the OAC.* (David Bader, September 19, 2022).

OAC Management is extremely grateful to the Chair and all the members of the COV for their willingness to serve NSF and for the dedication and enthusiasm they brought to their duties.

OAC Responses to Executive Summary Recommendations of COV

Through extensive discussion, the COV identified five top-level recommendations that the

committee believed would improve NSF's merit review process, and help future COVs in their reviews. OAC notes that all five of the COV recommendations include suggestions for measuring, tracking, and reporting on returns to investments by the NSF programs:

<u>**COV Recommendation #1 - Broader Impacts**</u>: *OAC should better clarify OAC-specific expectations with regard to Broader Impacts – including the nature and measurement of expected efforts and how efforts should scale with project size, the priority relative to other criteria in the review and selection process, and the level of post-award accountability*.

> **Management Response.** OAC agrees that attention to broader impacts (and the related issues of broadening participation) are important to developing a robust research enterprise and the advanced cyberinfrastructure that supports it, and are pleased that OAC Program Directors address the issues in their solicitations, panelist review templates and Review Analyses. We also agree that panel discussion and summaries should address broader impacts fully, including plans for measuring, monitoring and assessment, as appropriate to the proposed work and consistent with guidance from the National Science Board (NSB). Currently, panel briefings are used to reiterate the guidance; however, this message can be further reinforced during the panel and the approval of the Panel Summaries. OAC regularly identifies solicitation-specific Broader Impacts that it is seeking, and provides panel reviewers with review templates that include broader impacts.

> In October 2021, the Office of Integrative Activities within in the NSF Director's Office initiated a year-long COV Pilot Study. All COVs held between October 2021 and October 2022 were to participate in a pilot that required the inclusion of BI experts on COVs. The effort analyzed BI Themes within project summaries, suggested BI experts be added to COVs, conducted a post-COV-Survey, and compiled the survey responses to be used for future COV planning efforts. The group has begun working on the last item needed for this pilot study -- an in-depth comparative analysis of the COV reports from before and after the pilot implementation. The Final Report for the Pilot Study is expected to be released in mid-May.

> To better understand the nature and measurement of broader impacts, how they scale with project size, and the level of post-award accountability, OAC is exploring the establishment of a new position to serve as a Management and Program Analyst (Grant Outcome Specialist), with specific technical expertise in data analytics to perform evaluative work related to OAC program outcomes. The incumbent would contribute to the development of program metrics to help measure the related outcomes of each OAC program, and measure and track the return on investment for the annual OAC budget.

<u>**COV Recommendation #2 - Outreach**</u>: *Develop and implement a broad OAC outreach plan with a theory of change and associated metrics to gauge achievement of stated goals. The plan should cover outreach to both reviewers and PIs, in addition to setting priorities. Goals should include improving equitable access for all underrepresented groups including early career researchers. While the focus should be on all institutions, the importance of including MSIs and first-generation serving programs should be noted. OAC could increase MSI led workshops to ensure that OAC's research agenda includes diverse viewpoints. NSF should provide automated tools to help program officers find appropriate reviewers with a trajectory of achieving the same diversity as the national science community.*

> **Management Response.** OAC agrees that attention to outreach and equitable access are important goals, and is pursuing these goals through a variety of venues:

- Recruiting staff with expertise in outreach metrics and tool development;

- Expanding participation by OAC staff in activities attended by underrepresented groups, such as the TAPIA 2022 Faculty Workshop (9 Sep 2022), the STEM-Trek Workshop at SC22 (Nov 2022) and NSF Day in Mississippi (21 Nov 2022).
- Supporting studies that identify opportunities to democratize computation and bridge digital divides, such as *The Missing Millions: Democratizing Computation and Data to Bridge Digital Divides and Increase Access to Science for Underrepresented Communities* (A. Blatecky, NSF OAC-2127459);
- Developing pilot projects that expand access for underrepresented groups. Examples of recent OAC investments include:
  - Creation of capabilities through the Advanced Cyberinfrastructure Coordination Ecosystem: Services & Support (ACCESS) solicitations [NSF 21-555-6] to establish a suite of CI coordination services—meant to support a broad and diverse set of requirements, users, and usage modes from all areas of S&E research and education.
  - The Minority Serving Cyberinfrastructure Consortium (MS-CC), which expands access to the cyberinfrastructure necessary for research relevant to Minority Serving Institutions (MSIs), first targeting several Historically Black Colleges and Universities (HBCUs) and a Tribal College. In collaboration with Internet2, through a Cyberinfrastructure Center of Excellence Demonstration Pilot award, the Minority Serving-Cyberinfrastructure Consortium (MS-CC) supports HBCUs, Tribal Colleges and Universities (TCUs), and other MSIs by providing cyberinfrastructure-focused professional development opportunities, advocacy, and community engagement.

In response to the COV recommendation that "*NSF should provide automated tools to help program officers find appropriate reviewers with a trajectory of achieving the same diversity as the national science community*." NSF and OAC are prototyping tools based on systems such as Dimensions, a large research database that covers millions of research publications connected through more than 1.7 billion citations, supporting grants, datasets, clinical trials, patents and policy documents.

NSF is also working toward the implementation of NSF One ID, which will give scientists the ability to register in the NSF database and link their review record and proposal submissions. This would also include activities performed as a student, such as participation in the Research Experiences for Undergraduates (REU) program.

OAC also believes the Management and Program Analyst (Grant Outcome Specialist) position mentioned in response #1 will be key in creating the metrics needed for measuring OAC outreach.

COV Recommendation #3 - Success Metrics: *OAC should consider tracking the implementation and follow up on the recommendations of the various internal and external advisory bodies (e.g., ACCI, CI strategy committee, AD CI council, NSB). OAC should develop metrics and track the impacts/successes of its investments*.

Management Response. As advised by the COV, we will continue to seek opportunities for input from a broad range of stakeholders while maintaining the current high standards for merit review and proposal and award management. In addition, ongoing communication with the advanced research cyberinfrastructure community will be an important feature in future planning activities, and we will seek opportunities to reach out to new and existing communities.

As noted above, OAC's Management and Program Analyst (Grant Outcome Specialist) position will support the development of metrics and tracking of the impacts and successes of investments.

COV Recommendation #4 - Information Technology: *Fastlane (and research.gov) and the eJacket system should automatically gather and generate information, for example on COIs and compliance, to improve equity and ease proposal submission. NSF/OAC should consider automatically integrating reviews, panel summaries, review analyses, and diary notes into one system.*

> **Management Response.** OAC agrees that the use of automated tools facilitates award and program management and reduces the burden on Program Directors and panelists. There are a number of such tools in use throughout the Foundation and we will encourage OAC Program Directors to employ them as appropriate.

> OAC does utilize tools such as PowerBI and SharePoint to provide OAC staff with complete data of the merit review process. NSF does have Enterprise Reporting software to aid Program Directors with Conflicts of Interest, and efforts are being made to make this more effective.

COV Recommendation #5 – COV DataBook: *Strengthen and continue use of the DataBook for future COVs.*

> **Management Response.** This COV was the first at NSF to make use of the DataBook, an analytic tool generated by OAC staff, and OAC appreciates the comments in the COV Report noting that the DataBook ". . .*was easy-to-use and permitted deep insights by providing accurate proposal, PI, and programmatic data*."

> The capabilities that were piloted for the 2022 OAC COV -- DataBook, Power BI, Sharepoint sites and COV schedules with front-loaded timelines – is being adopted by all three of the other CISE Divisions for their COVs, which will be held September 20-22, 2023.