

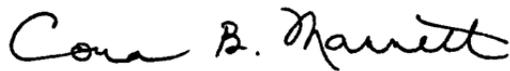


**National Science Foundation (NSF)
Information Resource Management Plan**
2013 – 2017

February 2014

The National Science Foundation (NSF) is pleased to present its Information Resource Management (IRM) Plan for 2013-2017. As required by 44 U.S. Code § 3506 and OMB Circular A-130, the IRM Strategic Plan provides the agency's information technology (IT) vision and strategy, and includes a description of how current and near term IRM activities help accomplish NSF's mission.

NSF's IRM Strategic Plan reflects the agency's core value of accountability: our commitment to operating with integrity and transparency and maintaining quality in administration, management, and oversight. The goals, objectives, and initiatives described in this document reflect NSF's responsibility to ensure effective information resources management, in support of the Foundation's work to advance fundamental science and engineering throughout the nation.



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Chief Operating Officer

3/5/2014
date



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1 Scope and Purpose

The *National Science Foundation (NSF) 2013-2017 Information Resource Management (IRM) Plan* defines the Agency's information technology (IT) vision and strategy, which is consistent with NSF's mission, goals, and objectives. The IRM plan includes NSF's vision for the future use of information technology as well as a description of how current and near term IRM activities help accomplish the Agency's mission. The plan also describes NSF's governance framework for managing IT investments, which includes the creation and maintenance of *NSF's Enterprise Modernization Roadmap*. As such, this document is intended to be read alongside NSF's Enterprise Roadmap.

Note that although the NSF IRM Plan addresses the agency's information management activities, it does not include all of the functions performed by NSF's Office of Information and Resource Management (OIRM). NSF's OIRM provides information systems, human resource management, and general administrative and logistic support functions to the NSF community of scientists, engineers, and educators as well as to the general public.

2 NSF Mission and Strategic Goals

2.1 NSF Mission

Created in 1950, NSF is an independent government agency responsible for advancing science and engineering (S&E) in the United States across a broad and expanding frontier. NSF plays a critical role in supporting fundamental research, education, and infrastructure at colleges, universities, and other institutions throughout the country.

Unlike most other federal research agencies, NSF does not operate its own laboratories or research facilities (with the exception of operations in the Polar Regions). Instead, NSF's role is that of a catalyst, fostering research that will advance discovery, expanding learning by cultivating a world-class, broadly inclusive science and engineering workforce, and building a national research infrastructure. NSF directly supports scientists, engineers, and educators through their home institutions, usually colleges and universities, throughout the United States.

The NSF mission is set out in the preamble to the National Science Foundation Act of 1950 (Public Law 810507):

“To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes.”

Approximately ninety percent of NSF's funding is allocated through a merit-based competitive process. On average, NSF receives 49,000 research proposals and makes over 11,000 awards to 2,100 colleges, universities, and other public institutions throughout the country annually.

In addition to authorizing support of basic scientific research, the NSF Act of 1950 makes NSF responsible for an information base on science and engineering appropriate for development of national and international policy, including facilities for S&E research, and for addressing issues of equal opportunity in science and engineering.

2.2 Information Resource Management and NSF's Strategic Plan (AXXA)

NSF's IT investments support NSF's mission and strategic goals as outlined in *Empowering the Nation through Discovery and Innovation: NSF's Strategic Plan for Fiscal Years (FY) 2011-2016*.

In alignment with NSF's overarching goals to "Transform the Frontiers" and "Innovate for Society," NSF's IT systems support mission activities to plan and manage programs, conduct the merit review process, make awards, provide post-award oversight, and disseminate the results of research investments. These systems, including Research.gov, eJacket, FastLane, and the agency's financial system, directly support NSF's programmatic activities and associated business processes.

NSF's investments in IT also support NSF's third strategic goal, "Model Organization," which emphasizes the agency's desire to attain excellence in all aspects of its operations. "Model Organization" underpins NSF programmatic activities and encompasses all of the agency's management processes. IT investments that support this goal include systems for human resources management, the preparation of the agency's financial statements, NSF's financial system modernization project (iTRAK), and procurement activities.

NSF's strategic goals lead the Foundation to set high standards for performance and integrity, in support of its mission to serve the public by carrying out agency activities efficiently, effectively, and sustainably. For example, NSF monitors the performance of agency IT investments to ensure they are addressing agency requirements while meeting established cost, schedule, and performance milestones (for more information, please see section 3.2, CIO Authorities and Governance).

NSF's IRM Strategic Plan sets the strategic IT vision and strategy in alignment with the NSF Strategic Plan, with NSF's Enterprise Roadmap laying out NSF's IT Modernization plans within the framework of NSF's technical architecture.

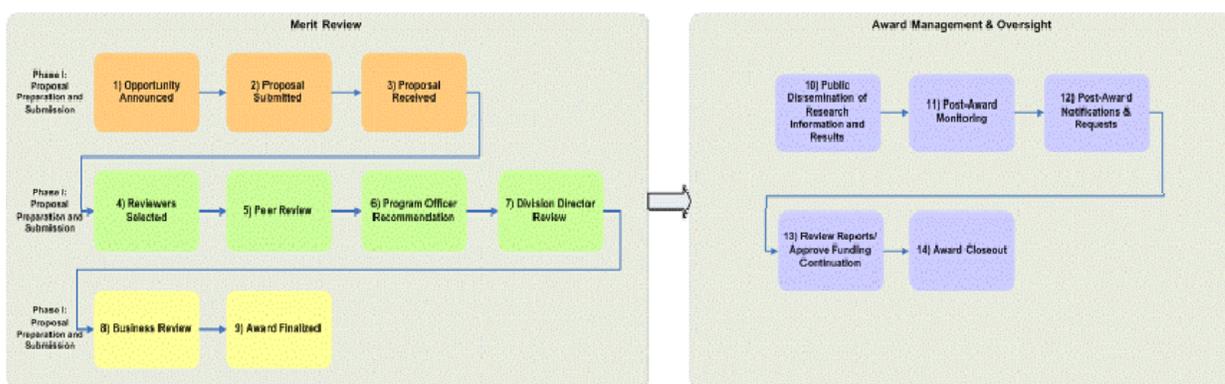
Together, these documents set the course for IT strategic planning and ensure its alignment with NSF's overall strategic goals.

2.3 NSF IT Support for Agency Strategic Goals (AXXB)

As described above, NSF's IT investments support the mission and strategic goals of the Foundation. Key IT activities in support of the agency's mission include:

1. **Supporting the Merit Review Process.** The Merit Review process, through which NSF oversees the planning, review, award, management, and results of competitive proposals, is the cornerstone of NSF's mission to "promote the progress of science." IT systems are critical to the success of each part of this process; 100% of NSF's proposals go through the automated merit review process.

NSF Grant Management Business Processes



IT is critical to, and enables the fulfillment of, the NSF mission. For example,

- The research community learns about proposal solicitations through electronic notifications and online listings;
- Research institutions submit proposals online via FastLane;
- NSF staff and guest reviewers review proposals online using FastLane and eJacket;
- NSF makes awards online through financial systems and processes;
- NSF staff monitor and manage awards through NSF systems; and
- NSF staff, the public, and the research community view award information and scientific results from NSF-funded awards published online.

In light of the role IT plays in fulfilling NSF's mission, NSF must ensure that its IT portfolio continues to meet its obligations to the NSF staff and research community by providing easy access to the business information and IT services they need.

To continue effectively supporting the merit review process, NSF is pursuing the following actions:

- Modernizing NSF IT applications;
- Ensuring that IT portfolio reflects the needs of NSF staff and stakeholders;
- Expanding videoconferencing and virtual capabilities for NSF mission work; and
- Enhancing access to NSF data.

For more information on NSF's plans related to this strategic goal, please refer to NSF's Enterprise Roadmap, sections 4 (Summary of Future Architecture) and 5 (Modernization).

2. Improving the Efficiency, Effectiveness, and Reliability of NSF's IT.

Across the federal government, a tight funding environment requires agencies to think creatively in order to "do more with less." NSF must continue to aggressively pursue efficiencies that reduce IT costs and reinvest savings towards improving the effectiveness and reliability of NSF's systems.

To achieve this goal, NSF is pursuing the following actions:

- Consolidating and standardizing IT Infrastructure;
- Consolidating and optimizing data center services and transitioning to cloud computing; and
- Retiring and modernizing legacy infrastructure and systems.

For more information on NSF's plans related to this strategic goal, please refer to NSF's Enterprise Roadmap, sections 4 (Summary of Future Architecture) and 5 (Modernization).

- 3. Ensuring Excellent Management of NSF's IT Portfolio.** Since IT is crucial to every aspect of NSF's work, NSF's IT portfolio must be managed wisely in order to help NSF advance its mission. This requires NSF-wide alignment and effective oversight and advocacy to succeed. NSF must therefore ensure excellent management and governance processes to create an environment where NSF's IT portfolio is planned and executed based on NSF-wide alignment and best practices in operation.

To achieve this goal, NSF is pursuing the following actions:

- Continuing to strengthen and formalize NSF's IT investment review and approval processes;
- Continuing to strengthen IT performance measurement and review; and
- Continuing to strengthen communication and organizational change management around NSF's IT.

For more information on NSF's plans related to this strategic goal, please refer to section 3 (IRM Governance and Management Processes) and NSF's Enterprise Roadmap, sections 2.2 (Governance and Use) and 2.5 (EA Program Performance Measures).

4. **Ensuring the Security of NSF's Systems and Information.** NSF recognizes that effective stewardship of federal systems and information is vital not only to NSF's mission, but to the security of the federal government. With techniques to compromise government data advancing continually, NSF's security posture must also continually advance to ensure that IT assets and resources are guarded against unauthorized access and misuse, while also ensuring that NSF staff and the research community have secure access to the IT services and information they need.

To achieve this goal, NSF is pursuing the following actions:

- Improving NSF's continuous monitoring and incident response;
- Ensuring IT security is incorporated into the life cycle of IT assets; and
- Strengthening incident response and risk management.

For more information on NSF's plans related to this strategic goal, please refer to section 4.4 (Information Management: Security, Privacy, and Accessibility) and NSF's Enterprise Roadmap, sections 4 (Summary of Future Architecture) and 5 (Modernization).

3 IRM Governance and Management Processes

3.1 Information Resource Management Governance

Though IT spending is a small percentage of NSF's overall budget, NSF recognizes the importance of ensuring that IT investment decisions are made wisely and efficiently and that they are integrated with other NSF decision-making processes (e.g. budget, program, financial). This requires NSF-wide alignment on IT priorities as well as effective oversight and advocacy to succeed.

3.1.1 NSF's Governance Bodies (CXXA, CXXB)

NSF relies on its two IT governance bodies, the Executive IT Resources Board (ITRB) and the Capital Planning and Investment Control (CPIC) Working Group, to provide this oversight, advocacy, and coordination. These groups are composed of senior leaders from across the Foundation and co-chaired by NSF's Chief Information Officer (CIO).¹ At the highest level, NSF's Executive ITRB monitors investments and makes decisions on the strategic investment of IT resources. The CPIC Working Group, subordinate to the ITRB, reviews NSF's IT investment portfolio and makes recommendations to the ITRB regarding strategic IT investments.

NSF's IT Governance Boards meet regularly, with more frequent meetings during the yearly budget process to evaluate IT business cases. The decisions made by ITRB and CPIC are integrated with NSF's organizational planning, budget, procurement, financial management, human resources management, and program decisions. For example, key agency officials in these areas, including the Chief Financial Officer (CFO), the Chief Acquisition Officer (CAO), and Chief Human Capital Officer (CHCO), participate in NSF's IT governance process.

3.1.2 Processes for Review of NSF's IT Investments (CXXC, CXXD, CXXE)

To strengthen its IT investment review process and ensure that NSF's IT strategy is aligned with NSF's strategic goals, NSF continuing to move towards a more formal and disciplined IT investment approval process driven by IT strategic thinking and NSF's Enterprise Architecture. Specifically, NSF is currently executing the following enhancements to its governance process:

- NSF has strengthened its process for approving centrally-funded IT investments by requiring advocates for new IT investments to complete IT investment justification documentation. This ensures that advocates for new IT investments have fully considered the business need, benefits, impacts, and NSF strategic alignment of each investment proposal; helps the CIO and governance boards verify that IT, rather than policy changes or business process reengineering, is the appropriate solution to a business need; and gives NSF's CIO and governance boards the information needed to review, approve, and prioritize investment proposals using a comprehensive evaluation methodology. This process is described more fully in NSF's Enterprise Roadmap.

¹ Members of the ITRB include NSF's Chief Information Officer and the Deputy CIO, the Chief Financial Officer, the Director of the Office of Information and Resource Management, and several Assistant Directors (ADs), who are leaders from NSF's Science Directorates. The CPIC Working Group is co-chaired by the CIO and the Deputy Assistant Director from the Biological Sciences Directorate (BIO). CPIC's members include NSF's Budget Division Director, the Deputy General Counsel, a representative from the Office of the Director, and the deputy heads of every NSF Office and Directorate.

- NSF has strengthened the operations of its Enterprise Architecture Working Group (EAWG), which is subordinate to the ITRB and is responsible for developing and maintaining NSF's Enterprise Roadmap. Modernization of merit review systems is critical to this effort.
- To continually improve upon the process by which NSF governs and guides NSF's IT portfolio, NSF's IT Program Management Office (PMO) conducts regular reviews of that process and coordinates the implementation of recommended improvements with the CIO.

3.1.3 Evaluating NSF's IT Investments (CXXC)

To ensure the efficient use of resources, NSF's CIO and IT governance boards, which have visibility into NSF's central IT portfolio, work together to both quantitatively and qualitatively evaluate proposed IT investments. NSF utilizes the IT budget review process to identify low-value or potentially duplicative investments.

NSF's approach to investment valuation, which includes thorough evaluation and prioritization of proposals, is expected to further increase NSF's ability to prevent duplicative or low-value investments. As part of NSF's evaluation methodology, NSF evaluates investment proposals using a variety of criteria, such as expected return on investment and alignment with NSF strategic goals and priorities.

As part of NSF's CIO Evaluation of investments featured on the Federal IT Dashboard, the Foundation considers several factors to determine ratings, including the investment's importance to agency mission, level of risk, and adherence to cost, schedule, and performance goals.

To complement the formal process described above, NSF's operational IT division has a process in place for monitoring the performance of IT investments. In this process, the Division Director for the Division of Information Systems (DIS) meets monthly with the project leads of high profile IT initiatives. In these meetings, the project leads report on accomplishments against established milestones and goals, risks and mitigation strategies, cost information, and upcoming plans. This process, along with the formalized approach to investment valuation (described above), is expected to ensure that issues with IT investments are quickly identified and addressed.

In addition to ongoing investment reviews, NSF has conducted three TechStat sessions focused on specific agency IT investments. These resulted in the termination of one investment which was identified as being low value.

For more information on NSF performance measurement and the evaluation of NSF services, please refer to NSF's Enterprise Roadmap, section 2.5 (EA Program Performance Measures).

3.2 CIO Authorities (DXXA)

In August 2011, the Office of Management and Budget (OMB) released Memorandum M-11-29, which highlights the key CIO responsibilities of Governance, Commodity IT, Program Management, and Information Security. This memorandum builds upon other key statutes and regulations governing the role of federal CIOs, such as the Information Technology Management Reform Act (“Clinger-Cohen”) Act of 1996; the E-Government Act of 2002, which includes the Federal Information Security Management Act (FISMA) of 2002; and OMB Circular A-130.

NSF’s CIO has appropriate oversight and control of funding requests, budget execution, IT planning and spending, and financial reporting. Below is a description of the NSF CIO’s level of authority in each of the four key areas identified in M-11-29:

Governance

The NSF CIO is the chair for NSF’s IT governance bodies, ITRB and CPIC, which review and approve investments in NSF’s IT portfolio. Section 3.1.1 includes more information on the membership of NSF’s IT governance bodies, which coordinate closely with the CIO to incorporate IT into agency budget and acquisition processes. As part of the governance responsibility, the NSF CIO leads the development of the information management and technology strategy for the agency. The CIO oversees the development of the agency’s Information Resource Management Plan and Enterprise Architecture Roadmap. Additionally, the CIO plays a leading role in monitoring the performance of IT investments. In support of this, the CIO is thoroughly integrated into the agency TechStat process.

Commodity IT

As a small, single mission agency with a centralized location and one data center, there is little (if any) duplication at NSF. NSF is actively participating in efforts to achieve efficiencies and cost savings in commodity IT. NSF is currently engaged in activities to consolidate its commodity enterprise IT components by moving to cloud-based services for commodity IT, including staff email, instant messaging and hosting for staff collaboration services. As part of the Federal Data Center Consolidation Initiative, NSF has undertaken efforts to facilitate cost savings and cost avoidance through the consolidation and virtualization of servers and storage. At the direction of the CIO, NSF is also focusing on activities that leverage IT purchasing power across the agency and strategic sourcing for commodity IT. For examples, please refer to section 4.2.1 (Commodity IT and Shared Services).

Program Management

The NSF CIO and Deputy CIO provide input into reviews of Program Managers and give regular feedback on their performance and development. NSF hires well-qualified project managers with special certifications, including advanced degrees and certifications in project management. Additionally, the CIO and Deputy CIO are integrated into the recruitment process for program managers who will be managing NSF's large IT projects. The Deputy CIO is involved directly in the hiring process for these program managers, and she reports to the CIO on these activities.

Information Security

NSF has a comprehensive, agency-wide program that encompasses all aspects of information security and privacy including policies and procedures; training; risk assessments and security plans; vulnerability assessments; comprehensive security controls; and technical safeguards to protect sensitive information. For more information on NSF's IT security program, please refer to section 4.4 (Information Management: Security, Privacy, and Accessibility). Per NSF policy and as required by the Federal Information Security Management Act of 2002, NSF IT security matters are reported to the CIO via the Chief Information Security Officer (CISO).

3.3 IT Workforce Planning (FXXA)

NSF's Division of Information Systems includes approximately 60 federal IT staff who lead the development and management of agency IT systems and operations. NSF supplements its Federal IT workforce with IT contractors. All NSF IT personnel have a strong commitment to helping fulfill NSF's mission to "promote the progress of science."

NSF continually strives for effective human capital management through the recruitment, development, retention, and strategic management of its workforce. NSF management is committed to maintaining a strong IT workforce model through a focus on recruitment and retention to attract and retain IT professionals. Additionally, NSF strives for the continual improvement of NSF's IT workforce through assessment, training, and staff development:

- NSF engages in improving IT workforce identification, assessment, and reporting capabilities to support agency requirements and to respond to overall Federal IT trends. NSF participates in federal workforce analyses, including Federal CIO Council surveys directed to the agency IT and cybersecurity workforces as well as Office of Personnel Management (OPM) human capital reporting that includes a focus on IT staff. NSF reviews the results of each workforce analysis to better understand its inventory of skills and uses this data to address identified competency

- gaps. Once all data are analyzed, competency gap identification will focus on identifying gaps between current competencies and performance levels required to accomplish critical agency work and meet performance level expectations. NSF also develops solutions to close competency gaps identified in surveys or in other workforce analysis activities, as appropriate. The intent of these efforts is to ensure that the NSF IT workforce is positioned to best support the agency's strategic goals and objectives, today and in the future.
- NSF strives to offer its IT workforce robust training opportunities. As part of its IT human resource strategy, NSF seeks to raise the knowledge and skills of its IT Project Managers (PMs) and provide the appropriate training to help them achieve or build on IT PM capabilities. In addition to supporting current IT project managers, NSF is committed to further developing the capabilities of staff interested in becoming IT project managers. Continuous learning is provided in a variety of venues for NSF employees. Project management training is directly supported through the NSF Academy and the NSF Continuous Improvement Program (CIP). The NSF Academy supports project management and earned value management (EVM) training. Agency PM training programs provide education in the essentials of project management, with content designed for managers in all fields and professions.

4 Managing Information as an Asset (GXXA)

Per the requirements of OMB Circular A-130, NSF conducts integrated planning activities to ensure agency information is managed throughout its life cycle. Planning activities are designed to ensure that, at each stage of the information life cycle, NSF considers the effects of decisions and actions on other stages of the life cycle, particularly those concerning information dissemination.

The life cycle approach is a common framework for NSF's information management activities. NSF's capital planning and investment control process, considers information management at each investment phase, and system development life cycle (SDLC) gate reviews ensure the documentation and approval of investment goals, including requirements for the creation, dissemination, and protection of agency information.

4.1 Information Collection and Creation

NSF considers agency information creation and collection requirements, as applicable, during strategic planning efforts. For example, initiation and planning efforts for new agency IT systems and projects will consider downstream

information processing and dissemination activities, to ensure NSF is positioned to create or collect the right information before systems are modernized or developed.

4.2 Information System Design

NSF considers information management principles throughout the information system design process, including activities associated with acquisition, development, and implementation of new IT capabilities. NSF's information systems strive to support interoperability and information accessibility, while ensuring compliance with enterprise architecture standards.

NSF's IT and acquisition divisions work closely together to ensure that acquisitions are clearly defined and that NSF's solicitation process will culminate in an award that provides the best value for NSF. Purchase requests for IT requirements exceeding the purchase card limit must be reviewed by NSF's IT division to ensure adherence to agency IT policies and to provide a safeguard against duplication. For all IT commodities procured by NSF, a major aspect of acquisition planning is determining the most efficient and cost effective procurement strategy, including the use of Strategic Sourcing techniques.

4.2.1 Commodity IT and Shared Services (HXXA, HXXB, HXXC, CXXG)

NSF has successfully leveraged shared services in a number of areas and plans to further expand its use of Government and commercial shared services as appropriate to support agency and federal goals. For example, NSF has successfully adopted Government-wide shared travel, payroll, time and attendance, and personnel systems and has decommissioned its legacy applications to support these functions.

NSF has completed, or is in the process of implementing, Strategic Sourcing initiatives for many commonly procured IT commodities, including personal computer (PC) and laptop requirements, IT licenses/software agreements, wireless communications devices, printers, and short term laptop rentals used in NSF peer-review meetings. Furthermore, NSF maximizes the use of available Federal Supply Schedule (FSS) and Government-wide Acquisition Contracts (GWAC), including the GSA Alliant and NASA Solutions for Enterprise-Wide Procurement (SEWP) contracts, to ensure the most efficient procurement methodology possible when procuring IT commodities, consistent with acquisition strategy requirements.

NSF is currently engaged in efforts to consolidate several commodity enterprise IT components by moving to cloud-based services. To date, NSF has begun or completed several cloud migration projects.. In 2013, NSF successfully completed its implementation of email in the cloud; instant messaging services will be moved to a cloud-based solution in 2014. Another key initiative is the

iTRAK implementation. This involves migrating NSF's core financial management systems to the cloud via a standard COTS-based shared service center offering. The iTRAK solution will be deployed at the end of Fiscal Year 2014.

NSF's adoption of commodity and strategic sourcing approaches for IT acquisitions, along with the migration of additional NSF infrastructure to the cloud and consolidation of virtual servers and storage, has helped NSF achieve required cuts in IT spending, which will then be reinvested in investments such as:

- Planning for and beginning implementation of an integrated enterprise data warehouse, which will provide a critical foundational capability for future innovative IT investments;
- Implementing new virtual meeting technologies, which will help achieve efficiencies and cost savings by enabling more virtual review panels for grant proposals; and
- Increasing public access to NSF data by making changes to NSF's legacy mission applications to make its data publicly available.

For more information about shared services and commodity IT, please refer to section 3.2 (CIO Authorities) and NSF's Enterprise Roadmap, section 5.7 (IT Infrastructure).

4.3 Availability of NSF Information

NSF recognizes the value of making available the data generated by the agency's funding of basic research. Increased awareness will be accomplished by providing data that inform the public about the agency's key activities, including national scientific priorities, NSF funding opportunities, NSF awards made, Freedom of Information Act (FOIA) results, science and engineering advances generated with NSF support, statistical data related to funding and funding outcomes, and data on the state of science and engineering education.

4.3.1 NSF Promotes Interoperability and Openness

Since its creation in 1950, NSF has viewed openness and transparency as critical to achieving the agency's mission. Consequently, the agency has built a strong foundation of openness policies and practices that guide its research and education activities. NSF has always been an open agency, making data available via NSF websites within the constraints of confidentiality and privacy. New technologies, many of which received their basic funding from NSF, now provide the means for NSF to take these openness practices to the next level.

NSF's default position is to make agency data and information available in an open machine-readable format. In support of agency and federal transparency initiatives, NSF has made data accessible to the public in machine-readable and

open formats that can be shared via a variety of mechanisms (email, Facebook, Twitter, etc.), printed, or downloaded for use with data mining and extraction tools. Additionally, mechanisms are provided to allow the public to provide feedback, share their assessments of the quality of information available, and make suggestions for additional NSF information they would like to see made available.

To further enhance transparency, NSF actively supports and participates in key federal open government initiatives to provide the public with insight into NSF-funded research, spending, and investments. These initiatives include Data.gov, which provides the public with easy access to NSF data in open and machine-readable formats; USASpending.gov, which provides financial transparency at the transaction level into NSF financial assistance, including contracts and grants awards; the Federal IT Dashboard, which offers insight and transparency into NSF's IT portfolio as a whole, as well as into the significant individual technology investments that support NSF's mission and work; and Recovery.gov, which provides a central, online location for taxpayers to track NSF spending and activities related to the American Recovery and Reinvestment Act (Recovery Act).

NSF is committed to the goals of the Digital Government Strategy and Open Data Policy:

- to enable Americans to access high-quality digital government information and services anywhere, anytime, on any device;
- to ensure the procurement and management of devices, applications, and data in smart, secure and affordable ways;
- to use government data to spur innovation across the Nation and improve the quality of government services;
- to collect or create agency data and build agency systems in a way that supports downstream information processing and dissemination activities; and
- to strengthen agency data management and release activities.

In alignment with these goals, NSF is moving toward an information-centric, rather than document-centric, approach to sharing the outcomes of agency work. Accordingly, NSF's new digital services efforts focus on content (e.g., NSF's information products) and on data (e.g., NSF's datasets on Data.gov), rather than information presented in a prescribed format.

NSF's ultimate objective is to openly share data to the greatest possible extent throughout its entire lifecycle. Per the requirements of the Open Data Policy and OMB Open Data Supplemental Guidance, NSF maintains a Public Data Listing which comprises an inventory of publicly available agency datasets. NSF is committed to continually expanding, enriching, and opening existing agency data.

4.3.2 Dissemination of NSF Information

The NSF website (<http://www.nsf.gov/>) disseminates information to scientists, engineers, university administrators, educators, business, vendors, the media, policy makers, and the interested general public. NSF's science and engineering Directorates and administrative offices collaboratively provide content for and manage the NSF website.

NSF web content is developed for the purpose of promoting and supporting NSF's mission. The NSF website is accessible to all, including those with disabilities and those without reasonable access to advanced technologies. NSF also integrates industry best practices for web technologies such as Extensible Markup Language (XML), Hypertext Markup Language (HTML), JavaScript, Really Simple Syndication (RSS), and Customized Style Sheets (CSS).

The NSF website allows users to select content organized for their needs: as applicants for funding, as educators or students, as the press, or as the interested public. The "NSF Update" functionality provides e-mail alerts to subscribers when new information is posted in the categories they select and also includes a range of RSS feeds for specific content types.

The NSF website provides information targeted to four primary user groups: the research and education community that competes for NSF research awards; the public, including K-12 educators; public information/media professionals; and those who use NSF statistical information on science and engineering.

NSF has three main offices that determine what content is made available on the NSF website:

- The Office of Legislative and Public Affairs (OLPA) uses the NSF website to communicate information about agency activities, programs, research results, and policies. OLPA employs a wide variety of communication tools and techniques to engage the general public and selected audiences, including Congress, the news media, state and local governments, other Federal agencies, and research and education communities.
- The Office of Budget, Finance & Award Management (BFA) produces website content related to the agency's funding of basic science and research. The BFA Policy Office is responsible for the development, coordination, issuance, and communication of NSF pre- and post-award policies for NSF's assistance programs, ensuring they are responsive to Federal law and regulations and yet sufficiently flexible to meet the needs of the diverse national and international programs of the Foundation. The primary document for dissemination of information on NSF's grants process is the NSF Proposal & Award Policies & Procedures Guide

- (PAPPG). NSF's Budget Division maintains the Budget Internet Information System (BIIS) within NSF's public website. BIIS contains information about obligations and funding rates by fiscal year, state, and institution, in addition to budget levels organized by account, dating back to the inception of the Foundation.
- The National Center for Science and Engineering Statistics (NCSES) fulfills the legislative mandate of the National Science Foundation Act to "provide a central clearinghouse for the collection, interpretation, and analysis of data on scientific and engineering resources, and to provide a source of information for policy formulation by other agencies of the Federal Government..." To fulfill this role, NCSES designs, supports, and directs periodic national surveys and performs a variety of other data collections and research. As part of its mandate to provide information useful to practitioners, researchers, policymakers, and the public, NCSES prepares about 30 reports a year, including *Science and Engineering Indicators for the National Science Board* and *Women, Minorities, and Persons with Disabilities in Science and Engineering*. NCSES also makes data available to the public through data tools and other data resources.

Ease of searching the NSF website is a primary focus. Along with searches of the entire website, NSF.gov offers searches specific to research fields and databases for awards, funding, calendar/events, staff, news, discoveries and publications. Databases linked to the website can be searched by date, topic, or browsed by an A to Z index. NSF uses formal information models such as XML schemas, document type definitions (DTDs), and RSS to categorize, disseminate and share information stored in systems.

As required by the E-Government Act of 2002, Section 207 (f)(2), NSF's current inventory of website content, priorities and schedules can be found on NSF's website at http://www.nsf.gov/policies/egov_inventory.jsp.

4.3.3 Agency Disclosure of Information and the Freedom of Information Act (FOIA)

The Foundation makes an enormous amount of information available under the Freedom of Information Act (FOIA). The public has access to most information about NSF without having to make a request for information under the FOIA, Section (a)(3) access provisions.

NSF is a small agency with one central FOIA office. The Foundation receives approximately 350 to 420 FOIA requests annually, mostly electronically, and discloses releasable records electronically upon request.

An estimated 90% of NSF's FOIA requests are for copies of funded grant proposals. These proposals routinely contain personal information exempt from disclosure under FOIA exemption 6 that protects personal privacy. In addition, they may contain confidential, proprietary business information potentially protected by FOIA exemption 4. Executive Order 12,600 requires agencies to contact the submitter and provide an opportunity to comment before any disclosure.

The Foundation's FOIA operations, to include the FOIA Information Handbook, annual reports, regulations and management plans for improvement of information disclosure are detailed and available online at:

<http://www.nsf.gov/policies/foia.jsp>.

4.4 Information Management: Security, Privacy, and Accessibility

Throughout the information life cycle, NSF carefully considers the application of security and privacy mechanisms. NSF's security program strives to maintain a balance that's consistent with its culture: assuring the Foundation's infrastructure and assets are appropriately protected while maintaining an open and collaborative environment for scientific research and discovery. NSF strives to maximize the availability of agency information within the constraints of confidentiality and privacy concerns.

4.4.1 Cybersecurity Management (EXXA, EXXB)

Aligning IT investment decisions with cybersecurity priorities

The agency's Chief Information Security Officer (CISO) and IT security staff work together with OMB and the Department of Homeland Security (DHS) to ensure that NSF's cybersecurity program aligns with federal cybersecurity priorities and requirements. As such, NSF's cybersecurity program is based on two fundamental philosophies drawn from Government-wide requirements and industry best practices. First, NSF has adopted a risk management approach where risks are assessed, analyzed, and understood, and then appropriately mitigated. NSF's risk management framework helps the Foundation determine the appropriate balance of the operational and economic costs of protective measures with gains in mission capability that may be made through IT security controls. Second, NSF takes a layered approach to security, wherein the information systems and assets that are the most sensitive or most significant to the Foundation's mission are protected by the most extensive security controls.

Continuous monitoring and vulnerability management are also crucial components to NSF's security program. NSF maintains an operational and technical suite of continuous monitoring activities to provide management with near real-time security status information in order to take appropriate risk mitigation actions and make cost-effective, risk-based decisions. NSF's robust vulnerability management program ensures that applications and devices hosted on NSF networks undergo routine and extensive vulnerability scanning to detect and remediate potential threats.

NSF's use of the government-wide Trusted Internet Connection (TIC) provides an additional layer of protection for the Foundation's IT resources. NSF uses a Managed Trusted Internet Protocol Service (MTIPS) provider (CenturyLink) to supply TIC services for all NSF staff. NSF is 100% TIC-compliant at its Arlington, Virginia headquarters.

NSF was one of the first federal agencies to issue Personal Identity Verification (PIV) credentials to all employees. PIV credentials are used by all staff for physical access, which has improved physical and personnel security. NSF is currently executing a phased rollout plan to require the use of PIV cards by all NSF staff for logical access.

Continuity of Operations

NSF's continuity of operations program, a key element of the agency's cybersecurity efforts, is designed to minimize the loss of critical assets and information resources in the event of a disaster and ensure the continuation of a critical organization's operations and services. NSF is a Category IV agency for purposes of Continuity of Operations during an emergency. In alignment with this designation, NSF meets appropriate continuity planning, communications, emergency operations capabilities, and other related requirements.

Designated NSF systems have contingency plans that describe the activities required to recover the system and associated data in a disaster scenario. NSF's contingency plans include identification of the most critical and sensitive operations and resources, assignment of responsibility, training, restoration of operations, periodic testing, and offsite facilities. Per NSF policy, contingency plans are reviewed and approved by designated organizational officials, periodically updated to reflect the results of contingency planning activities and tests, and distributed as appropriate within the organization.

For more information about NSF's IT Security Program, please refer to NSF's Enterprise Roadmap, sections 3.5 (Security and Privacy) and 5.7.6 (IT Security and Privacy).

4.4.2 Securing Personal Information (GXXB)

The protection of personally identifiable information (PII) is a high priority for the Foundation. NSF remains committed to assuring that the NSF infrastructure and assets are appropriately protected while maintaining an open and collaborative environment for scientific research and discovery. NSF has taken a proactive and risk-based approach to assessing safeguards around PII in its information systems. NSF's approach balances the risk of loss of PII with the impact to the individual and the Foundation. There are many controls in place to assure that PII is treated appropriately. NSF has assessed current safeguards, updated privacy policies, identified investments and controls that are needed, and is developing near and longer term plans for the implementation of additional security controls. NSF has also conducted a review of policies, procedures and processes to prevent the intentional or negligent misuse of or unauthorized access to PII.

Examples of standard NSF practices and technical safeguards to protect PII include:

- *Privacy Impact Assessments* - In accordance with OMB Memorandum M-03-22, *Guidance for Implementing the Privacy Provisions of the E-Government Act of 2002*, NSF has a privacy impact assessment process to address how information technology systems are used to collect and store personal information and what controls are in place to protect this information. The privacy impact assessment is a vehicle to address privacy issues and review information types in information systems. Privacy impact assessments are developed during the project initiation phase of the system and reviewed at the time of system assessment and authorization, and/or when there are major changes to an application.
- *Technical Safeguards* - NSF takes a proactive and risk-based approach to assessing safeguards around personally identifiable information in its information systems. There are many controls in place to assure that personally identifiable information is treated appropriately. NSF assesses safeguards, updates privacy policies, identifies investments and controls, and implements additional security controls as needed.
- *Training Materials* - Required security and privacy training is administered annually to all NSF personnel. Security and privacy awareness training materials are reviewed and updated annually to ensure current legislative and OMB guidance are incorporated. NSF personnel receive additional training and information on their responsibilities relating to protecting sensitive information in the form of emails from the Chief Information

Officer, NSF memos, pamphlets on privacy and the protection of PII, rules of behavior forms, and the dissemination of NSF privacy-related policies and by the Privacy Act Officer.

4.4.3 Accessibility (IXXA, IXXB, IXXC)

Enabling a diverse environment

NSF uses IT to support a diverse workplace environment, where individuals of all abilities can work, interact, and develop into leaders.

NSF works to ensure individuals of diverse abilities can seamlessly work and grow at the Foundation. For example, NSF uses and promotes assistive technologies such as WebEx, video phones, real-time captioning, and video-remote interpreters. In addition, for over a decade, NSF has had a formal partnership with the federally-funded Computer Electronic Accommodations Program (CAP) to provide software and firmware to individuals needing accommodations.

NSF has a very mobile workforce, and provides staff with the tools and technologies needed to securely connect to NSF information while they are physically away from the office

Integrating accessibility considerations in the information lifecycle

NSF considers accessibility integration in its IT application quality assurance processes and in contracting processes for IT services. NSF requires that contracts for IT services comply with Section 508 of the Rehabilitation Act of 1973 and that vendors provide details of compliance to NSF in the contract. Also, NSF's release management process ensures that the accessibility of systems and IT tools is considered by developers and managers throughout application development, release, and maintenance. This process includes steps that require systems to identify and address appropriate accessibility issues, such as testing for 508 compliance through the use of screen readers like JAWS or Dragon Naturally Speaking. The release process also includes performance testing of remote access to the system for the use of teleworkers and individuals working off-site. All of these activities are reviewed and approved prior to deployment.

From an information dissemination perspective, NSF is committed to making documents on NSF.gov and subordinate agency sites accessible to the widest possible audience. NSF's accessibility specialists work with other federal agencies and federal web consortia to ensure agency documents are, to the maximum extent feasible, accessible to persons using special screen reading

software and hardware. NSF also encourages its grantees to use the web to disseminate information about their work, and to create web pages that are generally accessible for persons using screen reading devices.

At the top of most pages on NSF.gov, there is an invisible link to a text-only version of the page. In addition, there is a visible "Text Only" link in the footer of most pages. NSF produces many documents as PDF (Portable Document Format) files. Since PDF documents cannot be read by screen reading devices, each PDF document is accompanied by an ASCII, HTML, or word-processing version, or can be provided as a printed or Braille document upon request. NSF's commitment to accessibility is particularly stringent for any publication relating to NSF funding opportunities.

Building workforce skills related to Section 508 requirements.

NSF offers training to help build workforce skills relating to Section 508 compliance. NSF partners with the General Services Administration (GSA) to provide a Section 508 compliance training class at NSF's headquarters approximately six times per year. This course is open to contractors, NSF employees, and other federal employees.

5 Continuous Improvement of NSF IT Services and Systems (BXXA, BXXB, BXXC)

NSF strives to continuously monitor performance of IT services and systems and implement lessons learned to the greatest extent possible. In keeping with its academic culture, NSF employs a robust feedback loop to continuously monitor and improve on the performance of its IT investments. This feedback loop is an iterative review process consisting of both formal and informal feedback mechanisms. For example, the monthly meetings of NSF's primary IT governance bodies include discussions about specific staff feedback concerning NSF IT services and tools. NSF also holds IT Innovation Forums at which NSF scientists and program staff gather with IT managers to discuss potential improvements to NSF's IT services and solutions.

NSF utilizes performance metrics to assess the effectiveness of its IT investments. For example, each weekday morning, NSF's IT division hosts a 15-30 minute "tag-up" session attended by top IT management for the purpose of reviewing key activity and performance metrics for NSF's IT systems. This daily meeting helps ensure that NSF's IT program is responsive to the changing needs of NSF's customers and that NSF's IT systems operate as intended.

NSF has increased electronic outreach to the general public through its public website. The overall design of the website is regularly evaluated and adjusted to better serve both the research and education community and the public. The

planning, creation and maintenance of this website reflects a variety of inputs from several audiences, including usage metrics and customer satisfaction survey results.

As required by the Digital Government Strategy and the Open Data Policy, NSF has conducted outreach with citizens to obtain input on the agency's plans to deliver high-value agency information anytime, anywhere, on any device, and in open, machine-readable format. Specifically, NSF requested public input in prioritizing information and services to make more easily accessible through the use of interactive search and display functionality, and through mobile services. Input from citizens was used by NSF to prioritize the delivery of open data via web APIs and new mobile services, released in May 2013. Additionally, NSF provides a mechanism for public feedback and input on the Foundation's implementation of federal open data requirements.

The Foundation has also implemented performance measurement and customer satisfaction tools on NSF.gov, which accounts for over 95% of NSF's web traffic across all domains. In alignment with Digital Strategy requirements, NSF has implemented the required performance measurement tools to obtain web visitor data. Additionally, NSF has adopted the 4 key customer satisfaction metrics recommended by the Digital Analytics Program and received OMB clearance for their delivery in survey form. The survey is available to all NSF.gov site visitors; visitors who choose to participate answer customer satisfaction questions via an online survey tool.

6 NSF'S Enterprise Architecture Roadmap

The NSF Enterprise Architecture (EA) is a business-driven blueprint that describes NSF's current, future vision, and transitional states in terms of strategy and performance, business, applications and services, technology, data, and security at the end of a two-to-five year planning horizon, and provides a plan for transitioning to the desired future state. NSF utilizes the EA as the foundation for IT modernization, driving both investment in and implementation of systems and technologies that will transform NSF's business.

The NSF Enterprise Modernization Roadmap describes the approach and IT initiatives that NSF will employ to achieve its EA. NSF employs a segment-based framework for designing an EA for the Foundation that includes analysis and documentation of mission, business support and processes and IT structures in their current and future states from integrated business, information and technology perspectives. The EA documents and influences business processes, services delivery, and IT investments, including the implementation of applications and their underlying technologies, in order to enable an integrated IT environment to support the different NSF programs and mission support goals effectively.

The primary purpose of the NSF EA Roadmap is to provide a priority-driven plan to help identify the Enterprise Architecture investments that will be included in NSF's IT budget.

For more information, please refer to NSF's 2013 Enterprise Modernization Roadmap.