

BOAC Subcommittee on NSF's Information Technology and Enterprise Architecture
Recommendations—December 2022

Introduction

The Subcommittee has been charged with reviewing NSF's IT Strategy and related Architecture and providing a bulleted list of informed recommendations for changes in process, direction, and/or potential investment in new and emerging technologies for possible implementation in the next budget year. The committee has completed its review.

The subcommittee was pleased to see the progress made by the CIO's office on the 2021 BOAC recommendations. For organizing the IT projects by Investment Groups, provides improved transparency and clarity on the impact of future NSF IT investments.

NSF's Strategic IT goals are appropriate, well stated, and align with NSF's strategic goals: 1. Boost Customer Experience to reduce burden and improve accessibility and inclusivity for digital empowerment. 2. Enable Data-Driven Decision Making to support the mission and communicate NSF accomplishments using Data & Analytics. 3. Unleash next-generation capabilities through continuous Modernization and Technology Innovation. 4. Excel as a Federal Agency in IT Organizational and Management performance.

The Subcommittee's recommendations augment NSF's current IT and emerging technology plans and support the NSF IT Strategic goals: Recommendation 1 (R1) is aligned with NSF IT Strategic Goal 1 (ITSG1), R2 with ITSG3, R3 and R5 with ITSG4, and R4 with ITSG2.

1. IT supporting a modern workforce

- a. Promoting continuous workforce improvement through comprehensive and integrated management systems for onboarding, training, and talent management.
- b. Identification, prioritization, and adoption of best-in-class industry and community solutions.
- c. Implementing reliable identification through Common ID platforms (e.g. commercial of the shelf (COTS) and government off the shelf (GOTS) solutions for identity management).

2. Enabling external stakeholders

- a. Building or acquiring tools to facilitate developing and operationalizing partnerships between NSF customers and making it easier for new kinds of partnerships between NSF and customers/groups by (1) maintaining a list of all internal and external collaboration tools, (2) retiring legacy collaboration tools, and (3) promoting tools that foster collaboration in a hybrid setting.

- b. Fostering partnerships across industry, becoming a facilitating partner for these relationships and influencing how discovery is shared in a manner that accelerates transfer to impact (government use, lab-to-market, commercialization, etc.).

3. Responding to changing mission priorities

a. Organization and prioritization

- i Maintaining a clear understanding of key resources including:
 1. Developing a common data inventory across NSF (including data from and common across the CIO, CISO, and CDO).
 2. Maintaining a central repository of internal and external users, with no more than two authentication methods (one for internal and one for external).
 3. Developing a lifecycle strategy for all IT assets and applications.
- ii Building and maintaining a central dashboard for key metrics for all key IT initiatives and posting a high-level annual summary on NSF's public website.

b. Organizational complexity

- i Aligning the organization to sustain a highly resilient operating environment yet flexible enough to pivot quickly based on evolving responsibilities or varying pace of initiative execution.
- ii Using automation tools (organizational visibility tools) to help solve the documentation/transparency problem. Developing clear, documented, and dynamic metrics/KPIs and track these over multiple quarters and years.

4. Investing in Data and Artificial Intelligence (AI)

a. Developing an AI inventory to ensure there are synergies between the responsible officials for AI and the CDO.

- i Aligning the AI strategies across the official responsible for AI, the CIO, and the CDO.
- ii Ensuring coordination for the training of the NSF workforce and stakeholders on AI.
- iii In concordance with the "Executive Order on Promoting the Use of Trustworthy Artificial Intelligence in the Federal Government", compliance with the required principles of AI should be required for all NSF grants.
- iv Per their AI Inventory, NSF currently does not possess or utilize any AI systems for agency operations; NSF should identify and pilot use cases to advance its mission.
- v Incorporating AI-specific requirements into the NSF's data strategy and NSF's IT strategy.
- vi Ensuring there are IT policies in place to guide and manage the use of AI across the Agency.

- vii Establishing working groups and communities of practice to ensure the acceleration and adoption of AI.
 - viii Ensuring that all AI use cases are inventoried, and their training data is included in the data inventory.
- b. AI and Data Driven Upskilling and Training of the IT Labor Force**
- i Investing in data technologies to upskill and empower NSF employees is critical to achieving significant number of NSF goals under DIS CCB, DISKO, EDGE, HRIT, FSMWG and IMG pillars. Given the wide-ranging goals of NSF and with employee being at the center of success of these goals, we recommend the following:
 1. Transforming all employees to data consumers with easy access to data and low code data tools to encourage innovation and collaboration across cross functional organizations.
 2. Standardizing AI development and deployment with tools that fit the variety of user persona spanning business users to data scientists to help with swift deployment of innovations and continuous improvements.
 3. Training and upskilling to transform to Data/AI-First organization to unleash the creativity of the employees on wide ranging operational, customer and employee experience, and innovation goals.

5. IT Excellence

- a. Building tools for internal NSF customers and making it easier for new kinds of partnership between NSF and customers/groups.**
- i Maintaining a list of all internal and external collaboration tools.
 - ii Retiring legacy collaboration tools.
 - iii Promoting tools that foster collaboration in a hybrid setting.
- b. Cyber infrastructure and Security**
- i **Cyber and Compliance/ Zero Trust Architecture (ZTA)**—This is a required by Executive Order and needs to be a foundational part of the NSF’s IT strategy.
 - ii Formulating a public IT strategic plan that includes the Cybersecurity priorities – including ZTA.
 - iii Implementing robust repositories and inventories of data, applications, users, and IT resources to support ZTA. Invest in a modern, software-defined network with capable cyber defenses to facilitate authenticated flows.
 - iv Centralizing and secure all logs to allow rapid analytics with privacy and control.
 - v Assessing NSF’s Cybersecurity Operations using a reputable agency. Ensuring funding is allocated to address any deficiencies and consider leveraging one of the Government shared service providers.