IDA

GEAR Center

Request for Information (RFI) SPE-RFI-18-001

September 14, 2018

The Institute for Defense Analyses (IDA) is pleased to respond to the Executive Office of the President's (EOP) August 28, 2018, Request for Information (RFI) SPE-RFI-18-001 on behalf of the EOP Office of Procurement.

IDA is a non-profit, 501(c)(3) corporation, whose sole activity is managing Federally Funded Research and Development Centers (FFRDCs) that provide environments free of conflict of interest, supporting our Government sponsors' analytic and technical needs. IDA FFRDCs with expertise relevant to the RFI are:

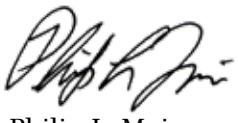
- The **Science and Technology Policy Institute (STPI)** in Washington, DC, provides rapid, authoritative analyses of science policy issues and related Government programs for the White House Office of Science and Technology Policy (OSTP) within the EOP, as well as extensive support for other Government agencies – e.g., NSF, NIH, NIST, FAA, DOC, DOE, and HHS. IDA has managed this FFRDC since 2003.
- The **Systems and Analyses Center (SAC)** in Alexandria, VA, was formed in 1956 to provide impartial systems evaluations and operational analyses for the Department of Defense's leadership. Over the years, this FFRDC has expanded its focus areas to include advanced technology, cyberspace, human capital, resource management, intelligence, and organizational effectiveness issues. In addition to DoD, SAC sponsors include DHS, DOS, CIA, ODNI, VA, and NASA.

IDA has built lasting relationships of trust and confidence with leaders and experts across Government, the private sector, and academia. Corporate firms share proprietary data with us, confident that those data will be safeguarded and not used for competitive advantage. Leading national and international experts know that their perspectives will be accurately and fairly represented in IDA analyses. IDA has earned a reputation in the Executive Branch and the Congress for producing authoritative and analytically sound products.

Further, our analyses often account for relevant interests of state and local Governments, and, as noted in the following pages, many are directly related to the Government Effectiveness Advanced Research (GEAR) Center focus areas listed in the RFI. For example, IDA has pioneered new applications for information technology (e.g., new techniques for text analytics) and identified key data sources and new data analytics methodologies (e.g., data and modeling analyses to improve greenhouse gas emissions measurements) and has long been involved in training technologies for the national security community, including the "Digital Tutor" for advanced computer-based training for the Departments of Defense and Veterans Affairs.

We look forward to exploring ways in which IDA can help the EOP establish the GEAR Center and support the Federal Government's management improvement and piloting needs.

Sincerely,



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Executive Summary

Performance.gov states, "We're looking for ideas, in the form of a request for Information (RFI), from the public, academics, experts, and industry on how to establish the Government Effectiveness Advanced Research (GEAR) Center, a public-private partnership to improve mission delivery, citizen services, and stewardship of public resources." The RFI itself goes on to identify particular challenges for early consideration including reskilling/upskilling of the Federal workforce and data commercialization. These improvements and challenges are symptoms of a Government bureaucracy that lags behind the private sector in terms of modernization and innovation.

The Institute for Defense Analyses (IDA) imagines a GEAR Center that brings together Government, private-sector, research, and academic partners to develop new ideas and the best ways to implement them. The GEAR Center's strategic approach should include four key strategic functions or one big IDEA:

- Identify: Work with the Government to identify both appropriate questions and the potential solutions to address them, while simultaneously working with industry to identify existing and emerging challenges they could assist the Government in solving and the technologies that could meet cross-agency priorities and management-related gaps.
- Devote: Facilitate Government investment in and devotion of resources towards development of existing and emerging technology solutions and processes from State and local Governments, academia, the private sector, and others through research, analysis, and findings presentation.
- Exchange: Engage both the public and private sectors in identifying data exchange and commercialization opportunities and develop methods and processes necessary to facilitate that exchange for current information as well as information generated in the future.
- Adopt: Support initial operating capability or low-rate production development and full operating capability adoption and deployments with organization, execution, and/or evaluation of beta-testing, verification and validation activities, and technology pilots.

IDA's FFRDCs regularly work with the Federal Government to perform these roles, whether we are supporting the National Institute for Standards and Technology as it creates new standards for the immediate occupancy of buildings following a natural disaster or working with the Department of Homeland Security (DHS) to evaluate of biodetection technologies for acquisition programs valued at $4.2 Billion. It does this by practicing five attributes that will be fundamental to the GEAR Center's operations: Trusted, Competent, Agile, Present, and Collaborative.

These attributes are reflected in the operationalized concept for the GEAR Center—a public-private partnership (PPP) between the Government and one principal organization with the ability to conduct outreach and establish a collaborative network of research and private-sector partners on an as-needed basis. The GEAR Center should create a satellite-based organization with working groups, partnerships, and pairings being created as a need is identified or as the private sector identifies new opportunities (including the ability to access Government questions and information) and demobilized as the need is satisfied. Further, the organization must have a staff with the ability to develop or attain, through synergy with one or more partner organizations, mastery of the business of Government and a relationship of trust with the organizations with which the GEAR Center will work.

The Government needs a partner with capabilities beyond investing the Government's capital. The GEAR Center concept involves both research and implementation support, combined with the ability to mediate Government and private interests. Hence, a 501(c)(3) non-profit FFRDC structure is the recommended approach, as shown in Figure 1. This facilitates an independent

GEAR Center whose role is not just to provide solutions but rather to mobilize talent that identifies challenges and solutions, locate experts and make them available to both the public and private sector, and to create evaluation, verification, and validation capability. The GEAR Center should be able to leverage existing organizations (e.g., the Business Executives for National Security (BENS), Transported Asset Protection Association) and approaches (e.g., the National Science Foundation 2026 Idea Machine), as well as novel approaches to building partnerships—for example, by leveraging prize competitions and innovation incubators.

This proposed governance structure already exists the IDA Science and Technology Policy Institute (STPI). IDA STPI is agile and responsive to Government needs. It is consistently called on to bring together expert panels with Government officials, and it has a demonstrated ability to implement the proposed satellite structure as needed.

Building on this governance structure, we envision three market-driven models—which may be implemented concurrently—for sustaining the GEAR Center as a self-sufficient entity subsequent to its establishment: (1) an indefinite delivery, indefinite quantity contract; (2) an operational savings performance contract; and (3) fee-based access to Government data with system administration fees paid to the GEAR Center. Both non-monetary (access to Government partners, access to Government data, and additional perceived or realized internal benefits) and monetary (fees for data-based applications, venture capital investment, and incentive contracts) incentives could provide motivation for partners collaborating with the GEAR Center and public-sector partners.

IDA is today engaged in design and construction of an environment that enables non-monetary incentives and data commercialization by making military personnel data and modern analytic tools accessible to the policy analysis community. The GEAR Center might attempt a similar approach with aviation maintenance data reported to the FAA, allowing the flying public, travel insurance companies, and other interested parties to find the airlines with rigorous maintenance and safety approaches or providing the consolidated data set to the same groups for their commercialization. Analytic data tools could prove useful in setting insurance rates, identifying reliable cargo shippers, or informing next generation process improvements in aviation design, among other ideas.

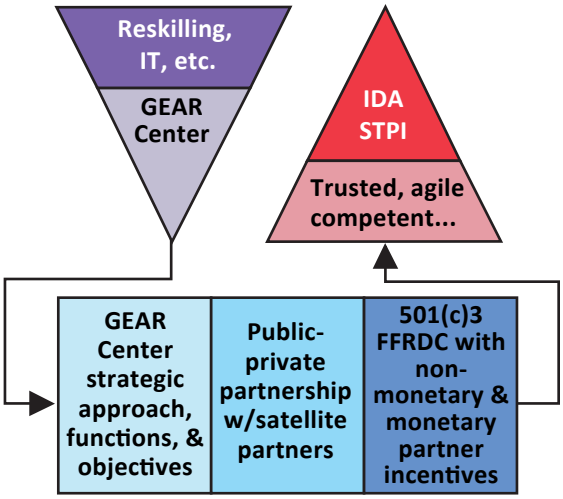

Figure 1. GEAR Center Operationalized at IDA STPI.

Similarly, IDA has worked with the Government on innovative and best practice training and reskilling methods since the 1960s, evolving approaches and new tools, while also providing analyses of the necessary skill sets to inform the next generation of training methodologies. Recent projects have included employment of the Digital Tutor for both Department of Defense (DoD) and Veterans Affairs (VA) implementation, Federal personnel exchange mechanisms to allow the private and public sectors to learn from each other through temporary personnel placements, and the reshaping of the US Army Corps of Engineers cybersecurity workforce.

IDA STPI, located in Washington, DC with the ability to reach back to IDA SAC and a range of public, private, academic, FFRDC, and University Affiliated Research Center (UARC) partners, provides a GEAR Center model, in place and available to Government agencies today. IDA STPI provides rigorous, objective, timely, and authoritative analysis for the formulation of national science and technology policy by providing policy-makers with accurate information on pressing and even controversial issues because it is trusted and independent.

RFI Question 1. Given the mission of the GEAR Center, what should be:

- **Its strategic approach and operating objectives?**

The RFI describes the GEAR Center Mission as:

Through applied research and live pilot testing, the GEAR Center would connect cutting-edge thinking with real-world challenges the Federal Government faces in serving Americans in the Digital Age. This means re-imagining possibilities for

- How citizens interact with the Government;
- Rethinking the delivery of citizen services and data;
- Reforming core processes (e.g., procurement, budget, IT investment and capital allocation); and
- Exploring how the public-sector workforce can be developed, reskilled, and redeployed in creative ways.

The RFI proposes a GEAR Center capable of supporting adoption of currently available technologies ("catch up to where the private sector services and capabilities are today") as well as laying "the groundwork for where Government operations and services need to be in five, 10, or 20 years…."

As noted in the RFI and other sources, there are a number of organizations that aim to perform this function or some piece of it—for instance, the US Digital Service and GSA's 18F work with agencies on improving their digital interfaces. The new Technology Management Fund provides IT modernization funding to accelerate agency implementation of new capabilities. The question, therefore, is how will the GEAR Center be different?

Strategic Approach: one big IDEA

- Identify

- Devote

- Exchange

- Adopt

Information technology has already led to an explosion of innovative ideas about business processes and the interaction of individuals with organizations. Now, there is an explosion in the amount of data available, in the analytical techniques for interrogating these data, and in the interfaces that allow citizens to interact intuitively with information. In short, the US Government should lack neither ideas nor ways to implement the best of them; the GEAR Center should enable both.

The essential problem is that a variety of cultural, legal, and organizational factors make it difficult for the Government to keep up with the speed with which opportunities are evolving and being instantiated in the private sector. The GEAR Center must develop a deep understanding of these factors and their sources and help break down barriers between the public and private sectors to enable the effective exchange of technology, information, and best practices. Further, the GEAR Center will need to facilitate the adoption of technology and best practices for the Government and the identification of and access to data suitable for commercialization by the private sector.

To facilitate these goals, the GEAR Center's strategic approach should include four key strategic functions or one big IDEA:

- Identify: Work with the Government to identify both appropriate questions and the potential solutions to address them, while simultaneously working with industry to identify existing and emerging challenges they could assist the Government in solving and the technologies

that could meet cross-agency priorities and management-related gaps. IDA's FFRDCs have recommended several ways that modern technology and techniques ("the cloud," data lakes, machine learning, "big data" approaches) can substantially improve Government efficiency and effectiveness, including citizen-Government engagement.

- Devote: Facilitate Government investment in and devotion of resources towards development of existing and emerging technology solutions and processes from State and local Governments, academia, the private sector, and others through research, analysis, and presentation of findings. IDA's FFRDCs regularly work with the Federal Government to assess policies and procedures and to evaluate technologies for investment. For example, IDA STPI is supporting the National Institute for Standards and Technology as it creates new standards for the immediate occupancy of buildings following a natural disaster. Likewise, IDA SAC has worked with the Department of Homeland Security (DHS) on the evaluation of technologies to meet the Department's biodetection needs; IDA is credited with helping DHS make a $4.2 Billion acquisition program decision.

- Exchange: Engage both the public and private sectors in identifying data exchange and commercialization opportunities and develop methods and processes necessary to facilitate that exchange for current information as well as information generated in the future, as IDA recently undertook for the Army in a series of "round tables" with senior industry executives on alternative technological approaches to providing soldiers with tactical communications networks they will need on the contemporary battlefield. Because of the success of this initiative, IDA is now serving the same interfacing role with industry in helping develop an Army-wide strategy to deliver computing services, applications, infrastructure, and storage in a commercial cloud environment.

- Adopt: Support initial operating capability or low-rate production development and full operating capability adoption and deployments with organization, execution, and/or evaluation of beta-testing, verification and validation activities, and technology pilots, as IDA has long done for the Defense Advanced Research Projects Agency and the Deputy Assistant Secretary of Defense for Developmental Test and Evaluation. Working in collaboration with DoD and another FFRDC, IDA has trained nearly 500 people in the performance of cyber tabletop exercises to support cyber security testing, validation, and implementation.

Two types of operating objectives should be considered for the GEAR Center: organizational objectives and project objectives. Some potential metrics by which the performance and effectiveness of the organization or project can be assessed are listed below.

Examples of organizational operating objectives include:

- Introduce and facilitate the adoption of a number of new technology or best practice solutions into the Federal Government

- Engage a number of private-sector partners through satellite efforts, working groups, challenges, and incubators for the identification of new technology solutions, information needs, and best practices

- Improve public-private partnerships (PPPs) through feedback collected from GEAR Center partners

- Introduce a number of process/technological innovations to improve Government's engagement with the citizenry

The project operating objectives may, and should, vary with the topics and cross-agency priorities researched within the Center.

Examples of project operating objectives include:

- Help Federal, State, and local workers, and, most important, our citizens, through the introduction of new technologies or best practices
- Save Federal (or State and local) Government funds with the introduction of a specific solution
- Simplify existing Federal processes or technology systems across a number of Federal agencies through the introduction of one or more consolidated technology solutions
- Facilitate the availability of Government data sets for commercialization
- Incentivize private-sector partners through the creation of on-ramps to potential Government partners and the accessibility of potentially useful Government data sets
- Assess customer satisfaction with a new technology, information exchange, or best practice through feedback collected from GEAR Center partners

The GEAR Center can enhance and expand the application of digital innovation for modern, efficient Government-citizen interactions by establishing itself in the minds of Government leaders and private-sector entrepreneurs (as well as possibly philanthropic organizations) as a partner, confidant, and guide throughout the management change implementation lifecycle. To do so, the GEAR Center must demonstrate five operating attributes: Trusted, Competent, Agile, Present, and Collaborative. Specifically:

TRUSTED.

- For Government stakeholders, the GEAR Center must:
  - Understand the business of Government, its constraints, and its similarities and differences from private-sector operations
  - Understand the technologies and the process and cultural change challenges associated with introduction of innovations in the business of Government
  - Protect pre-decisional Government planning information
  - Be accountable, including, if required, interfacing with the Congress
  - Pursue the best interests of the Government, free from conflicts of interest or bias
  - Be transparent (an open book to the Government's auditors and oversight bodies)
- For innovators and entrepreneurs, the GEAR Center must:
  - Deliver motivated, empowered Government officials who are ready to move at "startup speed"
  - Provide coaching and direct support in addressing Government-unique requirements and regulatory hurdles
  - Provide solid, provable assurances of protection of innovation intellectual property (IP)

COMPETENT.

- Demonstrate technical expertise to knowledgeably discuss technology solutions, information, and best practices with private-sector subject matter experts (SMEs) and Government customers
- Build relationships with a wide network of stakeholders, experts, and sources of innovation ideas, to identify the high-leverage, high-value opportunities
- Quickly and effectively vet and connect compelling management problems with vetted potential technology solution providers
- Produce analyses of unassailable technical quality
- Help build the business case for those innovations and Government consensus for implementation

AGILE.

- Demonstrate the ability to draw on a cadre of experts to support research, analysis, and evaluation of technology solutions, information, and best practices in collaboration with the private-sector SMEs and Government customers
- Support multiple investigations and engagements simultaneously
- Recognize and act rapidly and effectively on emerging needs and emerging, new, or innovative potential solutions

PRESENT.

- Generate ideas and then work side-by-side with the agency and solution providers through the long, difficult, and often turbulent process of implementing disruptive change management
- Pilot, refine, and improve proposed solutions
- Help agencies implement, evaluate, refine, and improve
- Explain to, educate, and inform peers, the public, and the Congress
- Support the private sector in its efforts to engage the public sector, whether in the introduction of new and innovative management solutions, demonstration and discussion of existing tools and best practices, or the identification of information needs and potential Government data set solutions

COLLABORATIVE.

- Identify and engage private-sector partners and partner organizations for discussions and potential solution briefings or as challenge or incubator participants or SMEs
- Work with public-sector partners across Federal agencies and facilitate opportunities for those agencies to jointly pursue new technology solutions, activities, or processes
- Engage with key Federal Councils, including the Chief Information Officers (CIO) Council and the Chief Human Capital Officers Council to identify key reform opportunities and evaluate and implement new technologies, activities, and processes

- Reach out to academic, FFRDC, University Affiliated Research Center (UARC), national lab, and other research and analytic partners to provide the Government and the private sector with the best data analysis, operations research, piloting, beta testing, and verification and validation implementations

FFRDCs operated by IDA currently advance goals like those advocated for the GEAR Center across the Federal Government, establishing a reputation for demonstrating GEAR Center operating attributes. IDA STPI's recent Comprehensive Review found, "Being independent from a Government body, as well as not tied to the private sector, the status as an FFRDC enables a high degree of independence, objectivity, and impartiality to its analyses and products. Although STPI staff work closely with OSTP staff and staff of other clients, there is a premium placed on the objectivity of analyses and communication of findings." IDA STPI regularly works with and across Federal agencies to support and advise decision-makers on a variety of policy-related topics simultaneously, including space weather, Federal investment and commercialization practices, and the future economic impact of quantum information science.

- **Specific areas of innovation and practice to prioritize? For example, we anticipate an early focus on reskilling the Federal workforce and growing the economy through appropriate commercialization of Federal data.**

There are several potential areas of innovation and practice to prioritize early in the establishment of the GEAR Center. The RFI specifically identifies reskilling the Federal workforce and data commercialization. Reskilling the Federal workforce, for example, begins with a job task alignment and identification of new skills required now and anticipated to be required in the future. These skills must go beyond simple information technology and cyber security. As an example, for data commercialization, they will include data cleansing and validation, data analysis, and operations research, to help ensure that the right data are collected and then are used appropriately. Reskilling thus involves an understanding of how to transition Government staff to higher-value work, a subject with which IDA recently assisted the US Army Corps of Engineers shape its cyber workforce (as we discuss in Question 7).

Three additional areas for prioritized innovation and practice include:

- IT modernization – updating, standardizing, and integrating IT systems across the Federal Government is a necessary first step to other information technology and cyber security improvements and, likewise, directly impacts workforce reskilling, as retraining workers to work on outdated systems leaves them at a disadvantage and impedes efforts by the Federal Government to modernize other practices and procedures.

- Financial recovery mechanisms that reduce cash lost to taxpayers through incorrect payments to the Government – this offers a unique and early opportunity to learn best practices from the private sector and to address a Presidential Management Agenda goal, getting payments right.

- Planning, programming and budgeting execution (PPBE) – Within the last 10 years, Federal agencies including DoD and DHS have taken active steps to improve their planning and acquisition efforts with IDA's assistance; these efforts have included everything from program management and best practice integration into policy at the Department level to implementation at the program level.

These efforts would be consistent with a strategic approach of establishing the GEAR Center as the Federal Government's trusted management innovation partner.

Other areas for early focus could build on:

- Existing indicators of potential improvement, such as
  - Being on the GAO's high-risk list
  - Triggering adverse congressional attention
  - Infamy for high-touch or low-quality output
- Emerging digital age technologies that might be applied to significant (and cost-effective) benefit
- Services that touch citizens directly
- Potential value for the commercial sector

■ **The process to identify and prioritize additional new areas on an ongoing basis?**

The GEAR Center would implement an identification and prioritization process as shown in Figure 2.

Figure 2. The GEAR Center Identification and Prioritization Process for New Focus Areas.

The process would involve seven steps:

Assessment and planning. One of the essential GEAR Center Lines of Action involves collecting and sharing innovation and "leading practice" examples. IDA envisions a network of GEAR Center participants, with members changing dynamically based on how modernization opportunities pair with organizational interests. These groups would be called on to identify potential needs, gaps, areas for improvement, or new technology solutions that may meet an, as yet, unidentified need. Participants would be from all levels of Government, industry, and academia.

Solution Development Process. GEAR Center analysts, working with SME partners, would identify solutions as necessary to meet the gaps and needs identified in the Assessment and Planning stage. The GEAR Center would operate a virtual leading practices forum through which innovation ideas emerge and are mapped to specific improvement opportunities in specific Federal Government agencies. The GEAR Center would need to stay engaged in prominent management improvement and technology development forums, consistently searching for examples of innovative technologies applied to transform business, academia, or Government operations.

Inputs. Beyond the gaps and potential solutions, there exist a variety of additional requirements, conditions, and constraints that could govern how a solution can be implemented, or challenges to effective implementation. Identifying these requirements, available resources, and constraints on implementation are a key part of the GEAR Center process for identifying or limiting solutions for evaluation.

Delivery Mechanisms. GEAR Center opportunity pairings would facilitate the description and discussion of potential solutions and/or concepts of operation, employment, and implementation. These conversations would engage innovators with Government partners.

Outputs. Utilizing information gathered during the previous stage, the research partners would assess potential outputs, benefits, and costs of each solution.

Outcomes. In this stage, cost benefit analyses and return on investment over time would be assessed by the research partners, in collaboration with public- and private-sector partners.

Impacts. This stage allows for the identification of impacts from the introduction of new technologies or best practices; unintended consequences (positive and negative); the assessment of downstream, as yet unforeseen, uses of new approaches; and opportunities for the commercialization of Government data.

Potential focus areas can be evaluated through this process, as can be potential solutions. Although the process is presented as linear, ideas and focus areas can enter into the process in any step, and the steps can proceed out of order as needed. By creating standardized and comparable metrics for evaluating outcomes and impacts, the GEAR Center and partners can make prioritization decisions. Solutions might be chosen as low-cost, short-term wins or as higher-investment, longer-term wins.

RFI Question 2: How should a GEAR Center be operationalized, including its structure, such as a physical center, a network, a consortium of institutions, or other approaches?

The role of the GEAR Center is to facilitate innovation that can be evaluated and adapted to reform the business of Government and the interaction between citizens and Government as illustrated in Figure 3.

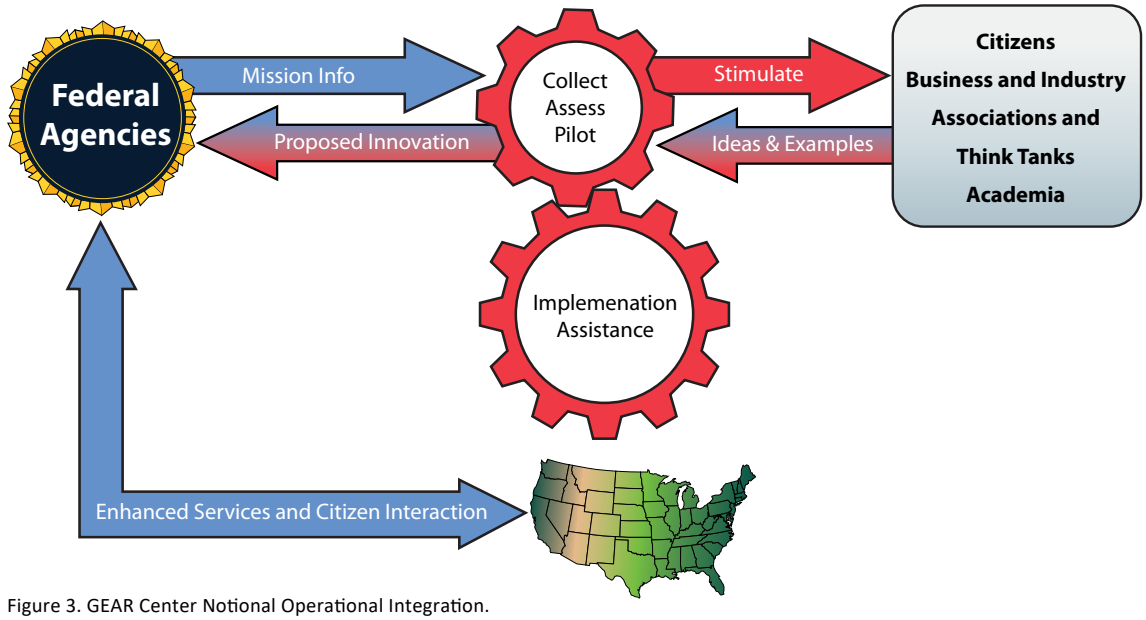

Figure 3. GEAR Center Notional Operational Integration.

The GEAR Center should be operationalized as a PPP between the Government and one principal organization with the ability to conduct outreach and establish a collaborative network of research and private-sector partners on an as-needed basis.

- The GEAR Center will need the flexibility of a network, where private sector and academic partners can join as the innovation-Government opportunity pairings meet their interests and expertise, and scale back involvement as those interests fade.
- The GEAR Center must have a permanent physical presence and staff in the Washington, DC metropolitan area (following the Defense Innovation Unit (DIU) playbook), to be easily accessible to Government partners. Some portion of the organization may well be located outside of DC.
- GEAR Center personnel must also have regular physical presence in several centers of technological and management innovation and participation in conferences and gatherings pertinent to industry and Government innovation and problem solving.
- The GEAR Center should create a satellite-based organization with working groups, partnerships, and pairings being created as a need is identified or as the private sector identifies new opportunities (including the ability to access Government questions and information).
- Staff must develop or attain, through synergy with one or more partner organizations, mastery of the business of Government and a relationship of trust with the staff of the agencies with which the GEAR Center will work.
- Similarly, staff must have the technical knowledge in the broad range of interesting "innovation spaces" to engender relationships and build trust with private and academic partners.
- The GEAR Center, in collaboration with both private- and public-sector partners, needs to be able to identify an incentives structure that encourages Government partners to bring forward challenges to be solved and to encourage private-sector partners to participate.
- The GEAR Center will need to pre-establish MOUs and NDAs to govern conversations and to ensure protection of proprietary information (PI), intellectual property (IP), and business sensitive information.

IDA STPI currently serves in the collaboration role in several of its projects with OSTP and other sponsors, serving as the single point of coordination to bring together a variety of partners. A recent IDA STPI study brought together public, private, and academic sector partners from more than 90 organizations to examine the current state of and educational pipeline for plant breeding in the public and private sectors. The study identified key shifts in plant breeding from being a public-sector function to a private-sector one due to the private sector's increasing role in developing, patenting, and selling seeds for specific crops.

RFI Question 3: What models of public-private partnership should inform the GEAR Center?

Two different types of PPPs should inform the GEAR Center: venture capital investment organizations and special purpose vehicles (SPVs) established as PPPs.

Current Government offices could inform the Government's relationship with the GEAR Center. For example, there are lessons regarding investment in technology innovation to be learned from the DoD's DIU and the US Central Intelligence Agency's In-Q-Tel, both of which perform strategic venture capital investment to support emerging technology innovations.

The RFI makes clear the Government's preference for a non-Government solution with the potential to be self-sustaining; therefore, the Government needs a partner with capabilities beyond investing the Government's capital. The GEAR Center concept involves both research and implementation support. It also needs to mediate Government and private interests. Hence, a 501(c)(3) non-profit structure—either new or part of an existing organization—may be the best approach. Building on the GEAR Center's operating attributes and the operationalization characteristics, the SPV established as a PPP is the preferred method for establishing the GEAR Center.

Two possible types of PPP SPVs seem appropriate to the GEAR Center mission: FFRDCs and UARCs. FFRDCs are defined in the Federal Acquisition Regulations. According to the Federal Acquisition Regulation (FAR), FFRDCs are intended to address an R&D need that cannot be met as effectively by the federal Government or the private sector alone. FFRDCs accomplish their work through a relationship with their sponsoring agency that is based on special access and longevity.

Although UARCs are defined neither in statute nor the Federal Acquisition Regulation, according to the Congressional Research Service (December 1, 2017), the primary differences between UARCs and FFRDCs are that UARCs must be affiliated with a university, must have education as part of their overall mission, and must have greater flexibility to compete for public and private R&D contracts.

Either of these types of entities could operate the GEAR Center. Owing to recognition in statute and regulation and to widespread use by several Federal agencies, the FFRDC model seems preferable.[1]

Two Government-IDA partnerships illustrate how the GEAR Center's innovation, best practice collection, and evaluation capabilities could be implemented: DHS's Office of SAFETY Act Implementation partnering with IDA's SAFETY Act team and DoD's Director for Operational Test & Evaluation's relationship with IDA Systems and Analyses Center.

- **What should a governance structure look like or include?**

The governance structure should look like a single point of contact organization for the Federal Government and act as a coordinator for a broader outreach. The GEAR Center should be an independent organization whose role is not to provide solutions but rather to mobilize talent that identifies challenges and solutions, to locate experts and make them available to both the public and private sector, and to create evaluation, verification, and validation capability.

The GEAR Center should be staffed by a small, agile, responsive team that has the ability to draw on a broader base of expertise in response to issues and build partnerships with Government, private-sector innovators, and the research and academic communities.

The GEAR Center should employ satellite working groups and virtual leading practice forums to bring together stakeholders for specific topics under consideration. Each will be co-chaired by a Government leader with a vested interest in the question, an innovation leader, and a technical expert from an independent research or academic organization; the GEAR Center would provide administrative, technical, and coordination support to these groups,

[1] Because the UARC can compete for public and private R&D contracts, the UARC model might be inappropriate as a vehicle for facilitating innovation transfer from private industry to Government.

similar to how IDA STPI supports the OSTP and NSF for the Government and collaborative working groups each organization hosts.

The GEAR Center should employ existing and novel approaches to establishing and building new partnerships—for example, by leveraging prize competitions and innovation incubators.

- **How should the GEAR Center maintain mission focus without the Federal Government being responsible for ongoing administration, staffing, and operational management?**

The easiest way to ensure that the GEAR Center is able to maintain focus is to ensure that it only has one mission: facilitate collaboration, innovation, and information sharing between the Federal Government, the private sector, and the research and academic communities. The model for this already exists within the FFRDC and UARC space, as well as among most non-profit organizations. The GEAR Center's success in accomplishing this mission relies on its ability to establish and maintain trust and integrative, collaborative relationships with various stakeholders and demonstrate competence and agility in problem-solving. So long as it is able to do so, maintaining the GEAR Center's own administration, staffing, and operational management will not be an issue.

Many examples exist of organizations that have convening ability across a broad array of stakeholders and sectors, and that are agile, responsive, and typically, if not always, self-governing, including but not limited to FFRDCs such as IDA STPI; Centers of Excellence, such as the National Network for Manufacturing Innovation; DHS Science and Technology Director's Silicon Valley Innovation Program; Local and state housing and redevelopment collaboratives; and Community based healthcare and homelessness coalitions.

IDA STPI is particularly well-suited to the GEAR Center responsibilities. IDA STPI provides rigorous, objective, timely, and authoritative analysis for the formulation of national science and technology policy. The staff regularly interacts with its Federal sponsors and other stakeholders and partners while successfully managing its own operations, staffing, and administration. IDA STPI is able to provide policy-makers with accurate information on pressing and even controversial issues because it is trusted and independent.

RFI Question 4: What examples already exist that serve a purpose similar to the GEAR Center, whether for Governments or other institutions?

The proposed governance structure already exists within FFRDCs, including IDA STPI. IDA STPI is agile and responsive to Government needs. It is consistently called on to bring together expert panels with Government officials. It has a demonstrated ability to implement the proposed satellite structure as needed.

IDA STPI "consulted with, and incorporated perspectives of, representatives of private industry, institutions of higher education, and non-profit institutions [and] expertly liaised with over 30 departments and agencies…"

Several organizations aimed at bringing private-sector expertise and advice into the Government, as well as groups that act as liaisons with the ecosystem of startups, exist in a variety of forms:

- State-level analogs to the GEAR Center
  - California Department of Technology
  - New York State Office of Information Technology Services
  - Virginia Center for Innovative Technology

- Industry organizations to support innovation and policy initiatives
  - Business Executives for National Security (BENS)
  - Transport Assets Protection Association (TAPA)
- Venture capital partnerships
  - In-q-Tel
  - Defense Innovation Unit Experimental (DIU)
- Product-oriented partnerships
  - Accelerators and incubators devoted to Government issues
  - The Drugs for Neglected Diseases Initiative (DNDi)
  - The International Acquired Immune Deficiency Syndrome (AIDS) Vaccine Initiative (IAVI)
  - The Tuberculosis (TB) Alliance
- Policy and decision-making partnerships
  - BioWatch Advisory Committees (three levels of Government in cross-agency collaboration with private and academic sectors)
  - Mission-driven partnerships (e.g., Customs Trade Partnership Against Terrorism (CTPAT)[2])

- **How might such examples be replicated, scaled, connected, or more systematically leveraged?**

It should not be the role of the GEAR Center to replicate or scale these models. Instead, the ideal GEAR Center should connect these existing resources and leverage them for their expertise. The GEAR Center should be designed to partner with organizations including, but not limited to, those listed above in order to leverage their capabilities and networks. Rather than scaling any one model, the GEAR Center should build on and help focus existing models and partners on critical Government needs that fall within its mission.

- **Opportunities for the Government to learn more about these examples, such as through a demonstration, virtual interaction, or other method?**

Most of these public-private organizations, by their nature, are already engaged with the Federal Government. IDA would draw on its existing relationships and expertise at building new connections with the private sector to facilitate dialogue consistent with the GEAR Center's purpose. According to IDA STPI's Comprehensive Review, IDA STPI "consulted with, and incorporated perspectives of, representatives of private industry, institutions of higher education, and non-profit institutions [and] expertly liaised with over 30 departments

[2] The CTPAT is a voluntary PPP program whereby US Customs and Border Protection closely cooperates with stakeholders of the international supply chain (importers, carriers, consolidators, licensed customs brokers, and others) to improve the security of private companies' supply chains with respect to terrorism.

and agencies…such as the Continuity Communications Managers' Group conference and Communications Planners conference." IDA's role included "identifying unmet civil agency needs, identifying challenges and opportunities, and developing recommendations to inform, assess, and improve processes." The Government can learn more about the IDA's related research projects, including our work on technological innovation and public-private partnership building (e.g. DATAWorks) through the IDA Research Notes and Research Insights, as shown in Figure 4.

Figure 4. IDA Research Notes and Research Insights.

RFI Question 5: What model should be used to establish a GEAR Center, including:

- **The most effective and low-burden mechanism to establish a GEAR Center, such as the Government issuing a challenge, pursuing a traditional procurement, or an alternate approach?**

There are two broad paths for establishment of the GEAR Center. The first is to create a brand new, stand-alone entity. The second path is to amend or enhance the mission of an existing organization with responsibility for establishing and operating the GEAR Center.

New organizations can be selected based on requests for proposal (RFPs), challenges, or some other selection method. New organizations being seeded by the Government are often selected through a traditional RFP process, while challenges tend to be used for "technical and scientific competitions in which U.S. federal agencies invite the public's help to solve perplexing mission-centric problems."[3]

The GEAR Center is not an "event" or a single "perplexing or mission-centric" problem. Instead, it will become a permanent, sustaining organization that will embrace perplexing problems across the full range of Federal agency missions.[4] Therefore, IDA does not believe that a challenge is a feasible way of creating the GEAR Center (although challenges could be used by the GEAR Center to elicit solutions to Government problems, as the Department of Health and Human Services did in a "code-a-thon" aimed at bringing Government data to bear on the opioid epidemic). That said, a well-devised challenge that specifies clear evaluation criteria might be a way to elicit the GEAR Center concepts prior to issuing an RFP.

The GEAR Center could be established similar to DIU as an embedded Government office that obtains its analytic, technical, and operational expertise via contract or requisition.

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[3] "About/Introduction to Challenge.gov," Challenge.gov, https://www.challenge.gov/list/.

[4] Challenge and prize competitions are one of many devices the GEAR Center would employ to stimulate innovation in the business of Government. The Center must be able to work with federal agencies to identify innovation opportunities, select the ones for which a challenge might be appropriate, establish the rules & management mechanisms (including panels of judges), and work with the agency & challenge winner on implementation. These are on-going, sustaining and management functions. While these are challenging activities, they are not the "creative, technical and scientific competitions" suitable for a Challenge.gov approach.

This approach introduces delays inherent in executing a multi-year operation that requires authorizing legislation, hiring and appointment of Government officials, and acquisition of facilities and other services through competitive processes.

The GEAR Center could also be established and operated by a private non-profit or academic entity through a competitive solicitation or grant. This is straightforward but not timely. The timeline from Notice of Intent release (November 2014) to contract award (September 2016) for establishment of the DHS Homeland Security Operational Analysis Center (HSOAC) was almost two years. Contract award, however, does not constitute "establishment," and one could reasonably expect months or years of maturation needed to meet the needs of the Government officials who envisioned the HSOAC.

Hence, establishing the GEAR Center as a self-sustaining organization will be most easily and effectively accomplished within an existing organization that is already self-sustaining. In this approach, the GEAR Center should be established in concert with an organization whose mission is synergistic with the GEAR Center's mission and that has the capacity to accommodate these new mission responsibilities. As noted above, the ideal structure could be a 501(c)(3) in partnership with or as executed by an existing FFRDC.

In the interest of speedier implementation, it would take only a few weeks to task an FFRDC to stand up the GEAR Center in partnership with external organizations that are positioned to work directly with private-sector entities and foundations. The GEAR Center fits within the mission of several FFRDCs, which have staff that can be quickly re-assigned or supplemented temporarily with adjunct employees. Some of these FFRDCs, including IDA SAC and STPI, have extensive connections to industry and academia and experience in creation and operation of forums to stimulate Government-industry-academic dialogue and the flow of ideas in the area of management reform and innovation. IDA STPI, for example, recently worked with the NSF to perform a 2-year evaluation of the Experimental Program to Stimulate Competitive Research (EPSCoR). The study found that the EPSCoR program has contributed meaningfully to jurisdictions' increased competitiveness for NSF funds.

- **If the Government were to pursue a challenge or other open competition, the key considerations in establishing a panel of judges?**

Robotics competitions are one method for introducing IT training and innovation at an early age. The considerations, therefore—should the Government consider a challenge or other competition, either in establishing the GEAR Center or in evaluating potential solutions for challenges identified in conjunction with the GEAR Center—are derived from considerations in establishing judges for these competitions:

- Panel diversity should include a broad range of representatives from the Government and private, academic, and research sectors
- All judges should be able to consider trade-offs for investments and evaluate opportunities against established metrics
- Potential judges should be able to be objective and impartial towards any specific solution or organization
- Potential judges should be able to maintain confidentiality and participate in frank discussions about the applicants
- Potential judges should have a clear understanding of the rules, who is eligible to compete, an unambiguous goal for entries, and non-subjective metrics with which to score applicants

- Potential judges should be available to participate in person or via telephone or virtual conference to provide feedback on applications and discuss scoring and decisions
- Judges should be selected to represent a wide-pool of stakeholders as this can increase the visibility of the challenge and raise awareness of its purpose to a broader audience

The principal role of the judges is to review and score the challenge or open competition entries. At least as important as the criteria for judges are the metrics for evaluating the challenge or other competition. The metrics need to be measurable, non-subjective, and cover a range of verifiable characteristics of the solution including but not be limited to cost, experience in building partnerships and working with Government, and demonstrated innovation.

In the study *Informing U.S. Federal Agency Investments: A Review of and Lessons Learned from Federal Research and Development Facility Capital Budgeting Practices*, the IDA STPI team identified simple criteria for assessing potential solutions, which could also be applicable in evaluating challenge/competition entrants, including alignment with program needs, probability of success, timing, and political and other pressures which could impede performance.

RFI Question 6: How should a GEAR Center be funded? The Federal Government expects to provide seed funding to support near-term establishment of the GEAR Center agenda, but a market-driven model will be needed to sustain the Center facilities, operations, and agenda over the long term.

- **What could be sustainable funding approaches, including sources of funding?**

The RFI contemplates the GEAR Center being funded in whole or in part by "connect(ing) innovative research and private capital with (Government) needs." There are a number of models that could be implemented to fund the GEAR Center. Having the GEAR Center receive funding directly or indirectly from private sources could be problematic, however.

Consistent with the strategic approach and operating objectives identified in Question 1, we envision three market-driven models—which may be implemented concurrently—for sustaining the GEAR Center subsequent to its initial establishment:

- Indefinite Delivery, Indefinite Quantity (IDIQ)
- Operational savings performance contract
- Fee-based access to Government data with system administration fees to the GEAR Center

Both models call for funding provided by individual or coalitions of Government sponsors. To be clear, neither option requires continued appropriations funding from a Federal sponsor. Instead, the GEAR Center achieves sustainability through demonstrated value added to both Government and private-sector partners, with the former then seeking the Center out for additional efforts. (IDA SAC has operated as a self-sustaining organization in support of Government sponsors for more than 60 years.)

These models are selected because they ensure a continued focus on the Government's mission with no inadvertent or perceived biases or conflicts of interest such as those that might be introduced if the organization also received funding from private-sector entities.

Indefinite Delivery, Indefinite Quantity

The GEAR Center could charge agencies for its services. The GEAR Center's contract with the Government would have an IDIQ-like structure, allowing agencies across the Federal Government to place task orders with the GEAR Center for services within the Center's scope. As the GEAR Center develops innovative approaches to agency mission delivery, citizen services, or stewardship of public resources, the Center would engage with agency officials and encourage those officials to finance, with the agency's appropriated funding, task orders through which the GEAR Center would enlist partners, establish relationships, and execute projects in accordance with the sponsor's objective and the GEAR Center's mission.

One such project is described below—data hygiene and validation. In support of the Government's efforts to make data available back to the citizenry and potentially incentivize partners to participate in the GEAR Center-Government modernization efforts, the GEAR Center could perform data hygiene, validation, and other functions to ensure data are valid and available for partners and citizens to access.

This model is effectively in place and available to Government agencies today. IDA STPI provides these services through a contract with the NSF that is overseen by the President's Science Advisor and OSTP. STPI is operated by a single corporate entity—IDA. In its current operations and for purposes of the GEAR Center, IDA STPI would engage a number of private and academic partners to produce consortiums, working groups, forums, and opportunity pairings necessary to facilitate the widest possible access to management innovation.

Operational Savings Performance Contract

The GEAR Center could be paid by agencies on the basis of the savings they recoup from the introduction of new solutions. The Congress has authorized Energy Savings Performance Contracts through which a private organization would make efficiency improvements to a specific Federal facility in return for a share in the resulting energy cost savings. The GEAR Center could function in a similar fashion, developing innovative and more efficient approaches to facilitate agency missions or functions, implementing those improvements, deriving a future revenue stream from a portion of the savings achieved in those future operating costs.

While such an approach has the advantage of allowing the GEAR Center to operate and be paid on a performance-basis and simultaneously allowing an agency to make improvements without spending current budget funds, the technical difficulties in this approach are significant and hence may only be applicable in areas where such savings are easily measured.[5]

[5] First, establishing an agreed baseline for the costs of any particular Government operation is a difficult exercise and often requires quite extensive (and intrusive) investigation and analysis. Second, management process change normally extends over years. Many things will happen in Government over those years and establishing an audit trail from the old baseline, through years of turbulence, to a management improvement and thence to savings generated by that improvement (controlling for all other factors), may be unachievable. Third, some management process changes may generate further necessary performance improvements and expenditures (such as cyber security) without generating savings. OMB's financial scoring rules are likely to require GEAR's share of future year savings to be booked in their entirety as an obligation against the agency's budget in the first year of the GEAR-agency performance contract. Further, for any number of reasons, future Government authorities (in the Executive Branch or the Congress) may terminate implementation of process change prior to achievement of any savings or may not render the savings back to the organization, thus impeding their ability to reimburse the GEAR Center.

Fee-based Access to Government Data with System Administration Fees to the GEAR Center

There are a variety of PPPs based on providing public and business access to a valuable Government property. Toll roads and other infrastructure projects constructed through public-private ventures operate under this model. Spectrum leases are another variation of this approach. Just as with these examples, the Government could make the data sets available to commercial partners for a fee; the complexity of the data set, detailed vs. aggregate data, and level of hygiene and validation on the data could all be incorporated into the pricing schema the Government employs. This model requires a paradigm shift away from the free, open source data model (e.g., Data.gov) to a pay-for-access model.

In this construct, the Government would collect the fees but could pay the GEAR Center to host the data hubs and serve as the system administrator to give access to anyone who pays while ensuring preference to no particular entity. The independence of the hosting organization helps minimize potential conflicts of interest; challenges remain, however, in ensuring data availability when cost could become a limiting factor for some potential commercial users.

- **What market incentives are necessary to make the Center sustainable?**

For a GEAR Center self-sustaining through Government sponsor relationships, market incentives for the Center itself may not be appropriate. The GEAR Center, however, requires private-sector, academic, and research partners to remain sustainable and ensure the identification of new challenges and solutions, exchange of data and information, and implement new technologies and processes to improve Government management. Market incentives provide fundamental tools to encourage participation by a broad swath of potential partners. There are both non-monetary and monetary incentives that can be considered. Non-monetary incentives include better access to Government partners, increased access to data, and additional perceived or realized internal benefits. Monetary incentives include: fees for access to data, venture capital investment or other private capital, obtained through donations, and incentive contracts.

Non-Monetary Incentives

Non-monetary incentives may not require financial investment, especially on the Government's part, but are of value to potential partners because of other perceived and realized benefits.

IDA STPI "considers enabling partnerships across all sectors of Government and between the private and public sector to be one of its responsibilities."

Access to Government partners

One role of the GEAR Center is to act as an "on-ramp" for innovators to reach potential Government partners. While many organizations may have some direct methods to reach Government partners, facilitating access on a cross-agency basis may have value for some potential partners. This access provides more opportunities to target research and development towards articulated priorities and to introduce new and tested solutions to potential customers.

Access to Government data

Question 8 of this RFI recognizes a desirable Government asset: data. It is possible to imagine a GEAR Center that collects from its Government partner large volumes of data; places those data within a useful and accessible architecture; develops modern data access, analysis, and visualization tools; and offers data analysis services, thereby making the data available for private-sector use. Further, the GEAR Center could enable innovation partners to identify potential useful data sets and work with the Government to obtain access for them.

Utilizing the GEAR Center to facilitate the information and data sharing has the added benefit of utilizing an independent organization with no vested interest in profiting from the data to make the data available to multiple potential users/partners. Further, using the trusted GEAR Center helps ensure the data are handled by an organization whose inherent mission includes protection of proprietary, business-sensitive information—including information related to the safety and security of the public, US critical infrastructure, and US Government assets—and personally identifiable information.

Additional perceived or realized internal benefits

Sometimes partners are incentivized to participate in PPPs due to the perceived or realizable benefits to themselves. For example, small businesses participate in urban redevelopment partnerships to ensure that they have a voice in creating the plans and a place in the newly developed environment. Similarly, in the early days of the CTPAT, toy companies were early enrollees, choosing to participate because they perceived that the partnership could help reduce risks that could hurt their bottom line in the event their containers were used to import terrorism devices. They were incentivized to remain in the partnerships when they recognized that security improvements intended to reduce the potential for terrorists tampering with their supply chains also reduced more overt security problems, including intellectual property infringement and physical product theft.

Similarly, partners with the GEAR Center might identify additional perceived or realizable benefits from the partnership. For example, new technology solutions they create for the Government to improve processes may also help improve their own corporate management processes.

Monetary Incentives

Monetary incentives typically involve financial resource investment to encourage participation. These methods are not endorsed as funding mechanisms for the GEAR Center due to the potential biases they introduce and the challenges they place on an organization aiming to maintain its focus on providing the best solutions, independent of vendor or particular technology, for the Government to solve its challenges. That said, however, fees collected for accessing data or using applications developed with Government data; monetary rewards, as might be given in challenge/prize competitions or might be developed through venture capital relationships; and monetary incentives, such as might be built into contracts, may prove useful as motivations for potential private-sector, innovation partners.

Fees for data-based applications

In addition to the value of the data themselves to potential partners, there is potential value in the commercialization of those data. Building on the efforts to make data available to the private sector described above, the private-sector partners could then be incentivized not just through the direct benefit of accessing the data but also through their potential to commercialize those data.

For instance, IDA SAC, an FFRDC, is today engaged in design and construction of a data-based environment of this type through which military personnel data and modern analytic tools would be made widely accessible to the personnel policy analysis community (without fees). The GEAR Center might attempt a similar approach with, for example, aviation maintenance data reported to the FAA, allowing the flying public, travel insurance companies and other interested parties to find the airlines with the most rigorous maintenance and safety approaches, or providing the consolidated data set to the same groups for their use and commercialization. Analytic data tools could prove useful in setting insurance rates, identifying

the most-reliable cargo shippers, or informing next generation process improvements in aviation design, among other ideas. Additionally, the data could be commercialized and made available to the public as a stand-alone tool or as part of an existing travel platform to provide an additional attribute to support consumer decisions about which flights to book. Similarly, census and Bureau of Labor Statistics data, either provided as independent data sets or fused, could be curated and made available to the private sector; these data, today, are normally only accessed by highly trained analytic professionals and academics.

Venture capital investment or other private capital, obtained through donations

The GEAR Center could leverage private investment by partnering with private accelerators and incubators focused on Government needs (such as 1776 and the Techstars Autonomous Technology Accelerator with the US Air Force) and help privately funded companies solve Government problems to the benefit of the Government and its private-sector partners. The GEAR Center could also consider partnering with a venturing arm that invests in these kinds of organizations—using the proceeds to fund its operations (such as In-Q-Tel).

It is essential that the GEAR Center not be biased toward particular technical solutions or vendors but rather stay focused on facilitating the best agency solutions—and being prepared to move to a different solution if a better one is discovered. Hence, although venture capital or private investment may be a good incentive for partners, it should not be the funding stream for the GEAR Center.

Additionally, the GEAR Center, through its virtual forums, conferences, and working groups, could enable private-sector partners to have the opportunity to engage with each other as well as with Government and research partners. While it is important that these opportunities protect intellectual property and proprietary information, maintaining an independent GEAR Center allows for the establishment of information and idea exchange coordinated by an organization with no vested interest in any specific technology. It also supports the potential for new and expanding partnerships between private-sector entities including those with the potential for investment or other private capital.

Although not specifically focused on the development of private-sector partnerships, IDA considers enabling partnerships across all sectors of Government and between the private and public sector to be one of its responsibilities. For example, one IDA research team was recently credited with bringing together a city's Office of Homeland Security with a county's Public Health and Human Services Department for a series of emergency response concept-of-operation planning exercises. The relationship formed during those exercises extended to first-time, coordinated preparedness for real world events, including high-profile sporting contests and other events within the major metropolitan area.

Incentive contracts

Incentive contracts encourage on-time, efficient performance by the contractor through fee-based structures. These mechanisms could be used to incentivize innovators to work with the GEAR Center and introduce new technologies and processes to facilitate Government modernization and management improvement. While these are somewhat common practice across Government contracting, the GEAR Center offers a unique structure to support the innovation partner's receipt of incentives. Through the engagement with the private sector and Government partners, the GEAR Center helps develop requirements, conduct system or process evaluation, and address implementation issues as they arise. This facilitation on the part of the GEAR Center should help contractors stick to schedules and deliver system and process solutions to the Government customers in an on-time, efficient manner.

RFI Question 7: What models, approaches, and opportunities should inform an anticipated early focus on reskilling and upskilling Federal employees? For each question, please cite any available data or research to support your answer.

- **What are leading practices for effective reskilling, upskilling, and training adult workers, including opportunities for new applications of existing models?**

IDA has partnered with the Government and others on several efforts regarding reskilling, upskilling, and training. When considering skill sets (especially information technology (IT), cyber, automation, and related fields), it is important to recognize that these fields are constantly evolving, requiring new and complementary skills. Therefore, while there are a number of practices for effective reskilling and upskilling of adult workers, we present a limited number, selected to be broadly applicable and flexible for a variety of audiences and even a variety of skills. These and others could easily be incorporated and facilitated through the GEAR Center and partnerships for technology and process identification, gaps, and implementation.

Workforce planning. The first practice we recommend provides the foundation for the others: planning. Understanding the current state of skills as well as the current needs is fundamental to planning, as is continuous and iterative evolution of new skills and training programs. Planners must consider both how to bring in newly skilled or trained workers and how to shift, retrain, and upskill the workers with valuable institutional knowledge.

Learn-Unlearn-and-Relearn (LUNAR).[6] The World Economic Forum suggests that among the biggest challenges to new skill development is "unlearning" previous skills. Learning a skill fresh is often easier than learning a skill that is similar to skills previously learned, but with significant differences. This practice should incorporate continuous relearning and upskilling to sharpen currently relevant skills and expand those skills or add related skills so that the process becomes evolutionary.

Cross-training. Training individuals across multiple functions is one way of reskilling and promoting teamwork while increasing efficiency. This provides the Government with on-site skills to fill in when other employees step out, either temporarily or permanently. It helps reskill and upskill workers by keeping them in a role in which they are comfortable—which allows them to continue feeling a sense of accomplishment—while simultaneously taking on the challenging task of learning new skills. This helps keep the workforce from becoming frustrated with the reskilling process and builds new and improved capabilities.

Apprenticeship. In response to the Executive Order, *Expanding Apprenticeships in America*, a Department of Labor Task Force presented its final report[7] in May 2018, identifying "strategies and proposals to promote apprenticeships, especially in sectors where apprenticeship programs are insufficient." Much of the report focused on apprenticeship in industry; apprenticeships, however, also have a place in reskilling and upskilling workers within the Federal workforce. These apprenticeships, providing hands-on, paid training and skills-based learning, could be done part-time in conjunction with existing roles or full-time in preparation for new roles.

Mentoring. Hand-in-hand with cross-training and apprenticeship programs, establishing mentorship programs to provide guidance, support, and positive role models in the reskilling/

[6] C. Vijayakumar, "3 key steps to making sure your skills stay relevant," World Economic Forum, May 24, 2017, accessed September 6, 2018, https://www.weforum.org/agenda/2017/05/3-key-steps-to-making-sure-your-skills-stay-relevant.

[7] Task Force on Apprenticeship Expansion, Final Report to *The President of the United States*, May 10, 2018, https://www.dol.gov/apprenticeship/docs/task-force-apprenticeship-expansion-report.pdf.

upskilling processes should be further promoted. Mentors can serve important roles in helping the workforce understand what they can accomplish, through both example and discussion.

Multiple Training Techniques. Research suggests that there are several learning styles; the most common are visual, auditory, reading/writing, and kinesthetic/experiential. Every person has some combination of learning styles that work for them, so training should incorporate techniques that engage each of these styles to reach as many reskilling/upskilling participants as possible. These styles can be addressed separately—for example, using a mix of text and verbal materials combined with lectures to reach visual, reading/writing, and auditory learners, respectively—or in combination through virtual training and digital tutors that combine several learning styles into a single learning environment.

Cheat-sheet/Alongside models. Beyond the initial training and retraining, a leading practice includes easy reference documents ("cheat-sheets" or "job aids") to help reinforce new skills and "along-side models" (similar to cheat-sheets but more interactive or illustrative, such as video). Just as people turn to YouTube or WikiHow for step-by-step instructions in personal tasks, having these resources available for reskilled workers enables easy reference, on-demand, in a format with which they are already familiar.

The GEAR Center, in collaboration with its partners, should help the Government think about reskilling and upskilling as part of a continuous cycle of workforce talent development. In this role, it should help identify new practices evolving within the State and local Governments and academic, research, and private sectors; target specific practices to different skill sets across the Government; identify new and evolving skill sets and new methods for providing the training and retraining necessary; and support planning as needed.

IDA SAC recently employed these practices in helping the US Army Corps of Engineers (USACE) Chief Information Officer reshape the USACE's cyber workforce as illustrated in Figure 5. The recommendations help the USACE align services based on operational tempo and combine and eliminate current areas—emerging with delivery services and information management services—to build unity of effort and focus on core services, including cybersecurity and contingency operations.

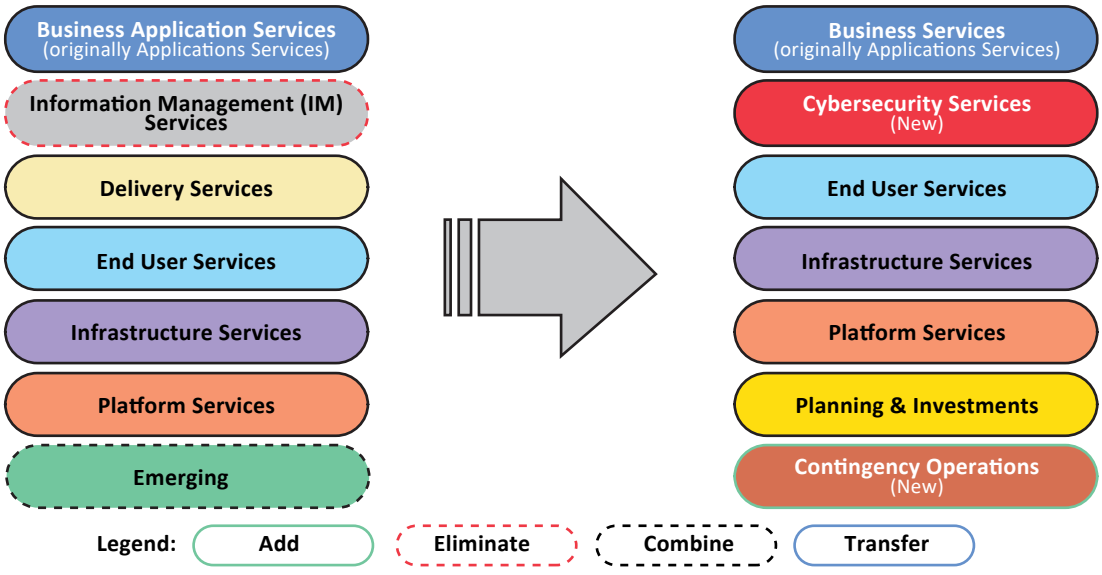

Figure 5. Transition of Current to Future Service Areas within the U.S. Army Corps of Engineers Cyber Workforce.

- **What approaches could be piloted for possible application and scalability across the Federal sector in various learning domains (e.g., cognitive, affective, behavioral) – such as gamification, use of massively open on-line courses (MOOCs), apprenticeship models, and other new approaches?**

Digital Tutor Successes:

- **Sailors outperformed those with an average of 9 years of fleet experience**
- **Military veterans were hired into positions with salaries commensurate with 3–5 years of technical experience**

Required workforce skills are dictated by the nature of the work employees perform and the technologies employed to do that work. Innovation in the nature of the work can emerge through process change enabled by technological change or technological change motivating process change; similarly, the specific approaches to providing learning and reskilling are driven by the skills being trained. Therefore, all of these approaches have a role to play—gamification, MOOCs, apprenticeships—and other models such as distance or other online learning, virtual training, digital tutors, simulations, collaborative virtual classrooms, role-playing and practicums, jigsaw techniques (where each participant solves a piece of the overall solution), and interactive conferences. New executive and management skills, for example, might be best acquired through executive education with role-playing and other active methods incorporated, while technical skills would be amenable to "digital tutors," and language skills may be practiced through virtual training and simulations. Certainly, the future of training and reskilling must include active training, where the learning is driven, in some part, through participation of the learners themselves.

IDA has worked hand-in-hand with the Federal Government in the development and implementation of these modalities for learning, identifying appropriate implementation and challenges to that implementation. For example, IDA, in collaboration with the National Academies of Sciences, Engineering, and Medicine, recently held a conference to assess how digital tutors could be used to accelerate the acquisition of technical expertise; participants agreed that the technology is ready for wider and more routine use. A recent study IDA conducted with Navy Information Systems Technology specialists found that sailors who completed 16 weeks of digital tutor training outperformed both those participating in a 35-week training continuum and those with an average of more than 9 years of fleet experience. Military veterans participating in a second IDA study completed an 18-week digital tutoring course; the study participants who sought IT-related jobs were hired into positions with salaries commensurate to 3–5 years of technical experience.

- **What are examples of metrics currently used to assess the effectiveness of reskilling and upskilling efforts?**

Again, as both applicable practices and methods are skills-based, there are example metrics that could be used to evaluate the effectiveness of reskilling and upskilling efforts. IDA often draws on the Kirkpatrick model of training evaluation, which identifies four levels of training success:

- Did students like the training?
- Did students understand the material?
- Did students use what they learned: did it make a difference in actual performance?
- Did it have a positive impact on the organization?

Each of these levels of training success have more detailed associated metrics, including

simply-evaluated metrics like completion rate and utilization rate—were students tasked to use the newly learned skills in their next role or assignment? There are also more complex or, possibly, more difficult to capture metrics, including the performance level (e.g., the grade obtained or the proficiency demonstrated), performance improvement from the start of the course until the end of the course, and the cost of the training itself. The efforts can be evaluated by individual or for the course as a whole based on the aggregated performance of the students. IDA recently worked with DoD to develop and select new metrics, including those identified above, for education participation and utilization across the defense workforce.

- **Do any of the suggested approaches have a particular nexus to the Federal workforce and/or to the automation of existing workflows, and transformation of existing skills to in-demand skills expected to comprise the "future of work"? If there are occupations or skill sets that would provide an opportunity-rich environment, please include specifics.**

The recommended approaches above are drawn directly from IDA's experiences going back to 1962, facilitating the identification of new skills and the training modalities to reskill and upskill the Federal workforce. Additionally, IDA has supported many of the Federal Government's talent management and workforce development efforts.

RFI Question 8: For an anticipated early focus on how Federally-owned data could help transform society and grow the economy:

- **Are there opportunities for the Federal Government to partner with the private sector to improve data architecture/taxonomy, and data quality/hygiene?**

Yes. Federal Government data systems were often built for narrow purposes without any intention of networking them. This stove-piped architecture with unique taxonomies and inconsistent data quality/hygiene complicates the application of advanced analytical techniques. Industry, however, has made great progress both in the application of machine learning techniques and in the ability to use unstructured data. These advances could be used to improve the quality and the reliability of analyses using the data while also making the use of these data more efficient. Such techniques could also be used to create larger sets of consistent data from smaller, specialized sources of data. This would allow correlations to be discovered between previously unconnected areas.

The role of the GEAR Center here is threefold:

- Work with the Federal Government partners to determine which data sets should not be shared.
- Work with the private sector, academic and research partners, and the Federal Government to identify which data sets should be shared.
- Work with partners as appropriate to perform data validation and hygiene (including removal of personally identifiable information (PII) or otherwise sensitive information) and identify the correct partner—the GEAR Center or other academic or research partner—to perform those functions for the specific data set.

- **Are there innovative economic models that highlight the value of the data, and would encourage private investment to capture that value both within the Government and across the broader economy? What are the barriers to implementing these models?**

The RFI cites examples—weather and satellite data—in which private-sector utilization has created new industries that drive economic growth. A recent startup in New York called Propel is helping recipients of the supplemental nutrition assistance program (SNAP) benefits (food stamps) make most efficient, healthy use of the benefit, as well as learn budgeting skills. MSDSonline, a product of Velocity EHS, allows users to link to material safety data sheets and corporate chemical information through an app that is designed for tracking and review of corporate hazardous materials. Each of these applications takes one or more data sets and commercializes it for profit in the private sector. We believe that demonstrations of value coming out of the GEAR Center will stimulate further investment in exploring the improvement, standardization, and commercialization of Federal data.

It is too early to assess which economic models would encourage private investment because the value of the data is limited only by the imaginations of the innovators. That said, there are non-economic models that would encourage innovation and ultimately investment. Kaggle is a good example, where competitions are held and prizes awarded. These excite a great deal of interest and competition, usually for very modest investments. Often the focus of these competitions is on the development of innovative data analysis techniques. But competitions could be held that identify innovative uses of Government data and publicize that usefulness. Such competitions might also suggest ways that the Government data could be improved.

Two current models that IDA has helped elucidate focus on the commercial value of data and analysis based on the data—space situational awareness and the Defense and Aerospace Test and Analysis Workshop (DATAWorks).

In April 2018, IDA STPI analyzed global trends in space situational awareness (for space traffic management). The study focused on the potential for objects to run into satellites physically, including other satellites and "space junk." The DoD shares some portion of the information it collects from its own satellites with a variety of partners globally. What other information could be shared? To answer that, it is important to understand what information the private sector aims to collect from their own satellites and how Government data, already collected, could supplement or even replace the need for privatized space satellites.

DATAWorks is building a community that understands the value of rigorous statistical approaches to solving the complex problems related to aerospace, defense, and national security.[8] One role of the group is to use data-driven analyses in coordination with subject matter expertise to translate the data into something that decision-makers can understand and use.

The biggest barriers to implementing these models, at least initially, are ensuring data cleanliness/hygiene, removing or aggregating out PII and other protected information, and assessing which data sets should not yet be released.

The GEAR Center would not act as the developer in these cases, but rather would serve as a management consultant that works with private-sector partners to identify potential data sets for use; as appropriate, facilitate access to those data sets (see question above); and overcome barriers to data commercialization while articulating the business case for sharing data to Government partners. Ideally, the GEAR Center would use some of its Government

[8] DATAWorks is hosted jointly by IDA, the National Aeronautics and Space Administration (NASA), the Office of the Director of Operational Test and Evaluation in the Office of the Secretary of Defense, and the Section on Statistics in Defense and National Security of the American Statistical Association.

seed money to produce a first success story that encourages further investment or draws on an organization that already has such successes. It is important that the GEAR Center's partnership with private-sector partners ensures protection of intellectual property and that the Government provides the data but does not become a competitor with the private sector.

- **Are there specific data sets that could be further leveraged by the Federal Government, start-ups, and the public – that, once scaled, have a significant potential to contribute to the greater good (bolster the economy, improve population health, provide services to the general public, etc.)?**

As noted in the RFI, Federal data have stimulated outcomes unimagined by the creators of those data (e.g., National Weather Service and Global Positioning System data). While some Government data are widely disseminated and used (e.g., Bureau of Labor Statistics and Census data), many data sets of potential utility are not widely available or widely exploited. For example, the Government's data.gov website makes available more than 300,000 data sets across a range of topics including climate, ocean, and local Government, but also including health, manufacturing, education, and public safety, among others. One role of the GEAR Center, therefore, is to help partners find the data sets and combine data sets to facilitate the solutions to bolster the greater good.

IDA STPI is able to track how each of roughly 1,300 federal, commercial, academic, state/local/tribal, and international observations map to 1,700 data and information products used by the Federal Government.

These will often be data sets constructed for specific, perhaps narrow, purposes unknown to other potential user communities. For example, IDA STPI assessed emerging and converging trends in manufacturing, identifying among their technologies synthetic biology as having the potential to manufacture biological substances from radically engineered biological systems for novel purposes. A number of data sets, some of which may already be available and others that are still being developed, could contribute to this work, including genetic sequencing and biological materials databases, and could be leveraged by the private sector both for research and commercialization within and beyond the manufacturing space (i.e., development of diet and workout plans based on genetic sequencing, commercially available forensics testing for civil court proceedings, etc.).

Similarly, cities and organizations have started using the Greenhouse Gas Inventory (GHGI) measures of emissions data as metrics for improving green investments and improvements geared towards protecting the environment. IDA worked with Federal partners across the Government to assess programs and projects related to methane measurement and monitoring. The scientific discussions for the study centered on integrating multiple fields of atmospheric measurement and modeling, life-cycle assessment and GHGI composition. The study drove opportunities for research coordination and improved methane emissions modeling. The data sources and models that the study identified could prove useful for cities and organizations already taking action to "go green," but could also help inform building design, utility investments, and marketing campaigns, among other commercialization opportunities.

IDA STPI has experience assessing federal technology portfolios. For example, IDA STPI has analyzed the reliance of the Federal Government on the portfolio of Earth observations (the sensors, systems, networks, surveys, and sampling programs that provide measurements of the Earth system) that it relies on, regardless of source, to meets it's civil objectives. IDA STPI is able to track how each of roughly 1,300 federal, commercial, academic, state/local/tribal, and international observations map to 1,700 data and information products used by the Federal Government. IDA STPI's experience in large-scale data collection and analysis could be leveraged within the GEAR Center to identify high-value datasets whose use could be enhanced through increased discoverability, accessibility, and usability.