

How Federal Government CIO Offices Can Enable Innovation



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Executive Summary

Recent media attention on innovation in the federal government has centered on the recruitment of tech talent from Silicon Valley. However, the successful application of CIO-Driven innovation within the federal government offers a sustainable way to improve government operating efficiency and performance, often while often also reducing costs. Survey results show that nearly 90 percent of federal employees are looking for ways to be more innovative at work.¹

This report examines current federal government practices in order to provide an understanding of what is working and not working in the creation and deployment of innovation. Through our inter-views with current and past federal Chief Information Officers (CIOs) and agency staff, we found the following challenges that inhibit innovation:

- Challenge One: There is insufficient Lack of buy-in from by key players
- Challenge Two: Lack of Current levels of process discipline are inadequate
- Challenge Three: Inability to Agencies lack the means to determine the value of innovation
- Challenge Four: Procurement rules inhibit quick wins
- Challenge Five: Few metrics are kept

Despite these challenges, we saw examples of innovation that demonstrate how agency CIOs help lead the way. For example, when faced with a costly and slow process to upgrade technology at foreign stations, former Peace Corps CIO Dr. Dorine Andrews re-envisioned the methodology, implementing a shift from shipping parts to shipping products. By thinking innovatively about the problem, she substantially reduced the travel time (and costs) associated with upgrading technology at the stations while delivering dramatically improved computing services.²

In another case, Federal Communications Commission CIO, Dr. David Bray³ recently faced the need to replace an aging public-facing consumer help desk. He was told by numerous sources that development of a new system would take one to two years and cost \$3.2 million. Dissatisfied with the proposed on-premise approach, Bray focused on championing what he calls positive “change agents.” Bray believes that a bottom-up approach best encourages increased innovation at the FCC, allowing him to pivot his role toward CIO-as-an-internal-venture-capitalist, focused on funding transformational efforts led by multiple actors across the enterprise. His efforts as champion paid off: the new consumer help desk, realized through a cloud-based approach, was created at one-sixth the anticipated price in less than half the projected time.⁴

1. <http://www.washingtonpost.com/news/on-leadership/wp/2015/04/27/steps-federal-agencies-can-take-to-be-more-innovative/>
2. http://www.washingtonpost.com/business/capitalbusiness/innovators-the-peace-corps-disparate-global-footprint-can-make-innovation-difficult/2014/03/28/b9be4d5e-b460-11e3-8020-b2d790b3c9e1_story.html
3. The names and affiliations of all of our interviewees can be found in the Appendix.
4. <https://enterpriseproject.com/article/2015/4/how-change-agent-saved-fcc-millions-legacy-it-upgrade>

Our interviews yielded five key findings:

- **Finding One:** Chief information officers recognize the value of innovation
- **Finding Two:** Examples of innovation and innovative practices abound
- **Finding Three:** Challenges are not insurmountable
- **Finding Four:** Innovation occurs in an ecosystem
- **Finding Five:** Leadership can foster innovation-oriented culture

Based on the interviews and our review of successful examples of CIO-Driven innovation in the federal government, we developed five recommendations for federal agencies seeking to stimulate innovation within their organizations. The success of the innovation effort relies most heavily on the agency director, who is charged with involving the key participants and setting the culture of the agency, and the CIO, who is primarily responsible for enacting the IT-enabled innovation process.⁵

- **Recommendation One:** Agency heads should involve key participants in the innovation life cycle
- **Recommendation Two:** CIOs should assess current and desired levels of innovation maturity
- **Recommendation Three:** CIOs should create a formal process for enabling to advance innovation within the agency
- **Recommendation Four:** Agency heads should foster a culture and space for conducive to experimentation
- **Recommendation Five:** CIOs should identify and implement appropriate metrics

With a collaborative approach, IT-enabled innovation is within reach for all federal agencies. As a result of, those agencies will be better able to fulfill their organizational missions.

5. In the case where an agency has an innovation office, the CIO's tasks may be shared with that office.

An Introduction to CIO-Driven Innovation in Government

Innovation is one of six trends identified by interviewees as drivers for transforming government organizations. In order to drive transformation through innovation, agencies must:

- Articulate the value of innovation
- Create a culture of innovation within their agencies
- Align innovation initiatives with the mission of the agency
- Access innovators outside of government
- Implement performance measurement metrics for of the outcomes to of innovation⁶

In all cases, technology and the leadership to implement it effectively are the paramount criteria for success.

It is helpful to begin with a definition of innovation, and we asked our interview respondents to provide one. Gary C. Wang, Deputy Chief Information Officer, Department of the Army, defines innovation within a military context as “the application and generation of ideas to processes, products and services that provide an unfair competitive advantage to the [U.S.] war fighter.” Barry C. West, former CIO at five government agencies, defines innovation as “[breaking] the mold on current trends to become more efficient and effective.” Peace Corps’s Andrews adds that innovation is “difficult but not altogether impossible,” while Amy Northcutt, Chief Information Officer of the National Science Foundation (NSF), emphasizes that innovation is a process and not an event.

How do federal government executives implement appropriate mechanisms and effective projects in which IT enables innovation? To find out, we interviewed a cross-section of large and small federal agency information technology leaders, including CIOs, as well as other innovation leaders throughout the federal government. We found that much of the responsibility for innovation is placed on the shoulders of these individuals. The goal of this report is to focus on best practices and common challenges in order to develop a road map and model for innovation in the federal government. To do so, we examined:

- Emergent federal structures and programs
- The current view of CIO-Driven innovation in the federal government
- The potential obstacles and measures of success for CIO-Driven innovation within the federal government

A list of those interviewed for this report is included in the Appendix.

6. See <http://www.nextgov.com/cio-briefing/2013/11/three-technology-trends-driving-big-changes-federal-managers/73181/> for more trends driving changes in government.

Federal Policy and Structures Supporting Innovation

New structures to support innovation have sprouted across the landscape of the federal government over the past 10 years. We cannot possibly identify and discuss every office or position implemented during that time, so we will focus instead on a few that illustrate the breadth and scope of change currently occurring across agencies.

Chief Technology Officer. The position of Federal Chief Technology Officer (CTO), also referred to as the Assistant to the President, Associate Director for the Office of Science and Technology Policy, was created in April 2009 with the appointment of Aneesh Chopra.⁷ The U.S. CTO is responsible for ensuring and advancing the use of innovative technological approaches to support government priorities, including job creation, affordable healthcare, enhanced energy efficiency, open government, and homeland security. A key component of the CTO's mandate is to employ an agile, lean-startup approach to create innovation within the federal government.

Innovation Labs. A new phenomenon has arisen within the federal government in the past five years: innovation offices,⁸ such as the Innovation Lab in the Office of Personnel Management (The Lab @ OPM) and the Department of Health and Human Services IDEA (Innovation, Design, Entrepreneurship and Action) Lab. As with any new organizational innovation, there is not a single, dominant paradigm for innovation offices. In their report to the VIDERITY Center, Burstein and Black identified a wide range of structures as the concept continues to develop and coalesce within government organizations:

- **Laboratory.** The laboratory is an autonomous group charged with developing outputs, often in partnership with other agency groups or the public.
- **Facilitator.** The facilitator is an individual or small team working to convene agencies on internal and external projects.
- **Advisor.** The advisor is an individual or small team providing agencies with innovation expertise for specific projects.
- **Technology build-out.** The technology build-out is an office tied to a specific technology that is both a tool and an innovation in itself.
- **Liaison.** The liaison is an individual or small team reaching into industry and other external communities.
- **Sponsored organizations.** The sponsored organization is an office backed by third parties such as universities, nonprofits, or industry.

Presidential Innovation Fellows. A Presidential Innovation Fellows (PIF) program was started in May 2012 as part of the Digital Government Strategy, and has recently become a permanent program. The first class of 18 PIFs was launched jointly by the U.S. Chief Information Officer and Chief Technology Officer in August 2012. PIFs are highly successful technology industry experts who compete for the opportunity to spend six months in Washington working on high-impact projects intended to better serve the American people and improve the functioning of government. The initial set of projects supported by the Fellows included:

- The Open Data Initiatives for better public access to government data
- RFP-EZ for improved government access to small, high-growth technology companies

7. Megan Smith was named federal CTO in September 2014.

8. Rachel Burstein and Alissa Black studied this emergent phenomenon in their VIDERITY Center report entitled *A Guide for Making Innovation Offices Work*.

- My Gov for better access to federal government services
- The 20% Initiative for improved international development assistance payment transactions
- Blue Button for America for better citizen access to their own health information

These successes and others led President Obama to issue an executive order in August 2015 to make the program a more permanent fixture in the federal government.⁹

18F. 18F (named in reference to its Washington, D.C., address at 18th and F Streets) was created in March 2014 as part of the U.S. General Services Administration (GSA). Established as a direct response to problems associated with the launch of HealthCare.gov, 18F houses the PIFs and was founded on a technology start-up model. Its mission is to reform the way the federal government executes IT-enabled innovation. by providing consultancy within the government to ensure rapid development, deployment, and integration of tools and services for the benefit of the public. The agency focuses on building high-quality software products, both directly through development and delivery, and indirectly through consulting services for federal agency partners.

U.S. Digital Services (USDS). U.S. Digital Services was established in the Office of Management and Budget in August 2014 and is based on a consultation model. Similar to 18F, USDS was created to bring IT industry best practices into the federal government and support administration technology initiatives. It provides advice and expertise to agencies on information technology, with the goal of improving and simplifying the digital experience for people and businesses interacting with their government.

For example, USDS spearheaded a recent effort to improve immigration processing. As part of its analysis, the agency found that the voluminous paper files required for permanent resident status in the U.S. are transferred six times during the approval process, an unwieldy and error-prone system. After thoroughly examining the procedures, USDS made numerous recommendations to speed and simplify the process.

The work of USDS is characterized by:

- Establishing standards to align government services with private-sector best practices
- Identifying technology enablers of scalable services
- Collaborating with agencies to deliver outstanding citizen-facing services
- Providing accountability to supported agencies

Open data initiatives. These initiatives are designed to reduce the distance between government and citizens by increasing accessibility and availability of federal government data, thus making government more transparent, participatory, and collaborative. The release of *A Presidential Memorandum on Transparency and Open Government* in January 2009 resulted in the establishment of the Data.gov website by the U.S. CIO in May of the same year, with the goal of making the data produced by the federal executive branch accessible to all.

Subsequently, a Presidential Executive Order was signed in May 2013 to make government information open and machine-readable. This Executive Order led to the establishment of multiple websites, including open.whitehouse.gov, aimed at making the federal government more transparent and providing better digital services to the American people. The lead agencies for these initiatives have included the U.S. CIO and CTO, highlighting the need for technical leadership in policy implementation.

9. Executive Order 13704, Presidential Innovation Fellows Program, August 17, 2015.

Trends in CIO-Driven Innovation in Government

While government executives in every administration have provided outstanding service and initiated innovation, they do not hold an exclusive license for innovation in the public sector. The concepts of open innovation,¹⁰ crowd sourcing,¹¹ ideation, and challenges have entered into the collective consciousness of federal agencies over the past 10 years, both by diffusion and by explicit implementation. Many of these initiatives have evolved under the leadership and support of agency CIOs.

Open innovation. Open innovation refers to a philosophy and approach under which boundaries between the organization and its environment become more permeable, encouraging organization staff to look both internally and externally for ideas; to not rely exclusively on their own knowledge, experience, and research; and to combine internal and external mechanisms to produce their products and deliver their services.

Crowd sourcing. Crowd sourcing—a portmanteau of crowd and outsourcing—is a method of soliciting individual contributions from very large, often online, external communities to supplement, complement, or even replace the efforts of a limited, direct internal workforce in order to meet an organization's production, service, or innovation needs.

Ideation. Ideation,¹² a word formed from the contraction of "idea generation," is an emergent concept of the last decade. Ideation is the process of finding solutions to agency issues through crowd sourcing techniques and the deployment of technologies that help staff gather new ideas from sources both internal and external to the agency.

In his VIDERITY Center report, *Federal Ideation Programs: Challenges and Best Practices*, Gwanhoo Lee explores four federal internal ideation programs through their three principal stages: generation, evaluation and selection, and implementation. Based on his case studies, he identifies four critical challenges to manage:

- The ideation process and technology employed
- Cultural change
- Privacy, security, and transparency
- Use of the ideation tool

Lee concludes that internal ideation is effective for:

- Leveraging creative thinking that already exists in agencies
- Further engaging federal public service agencies in solving difficult, enduring problems
- Building a sense of community and engagement around problems and their solutions across large, complex, and dispersed agencies
- Growing an organization-wide sense of commitment, trust, and ownership through dialogue between executives, managers, and workers, and between headquarters, bureaus, and field offices

10. H. W. Chesbrough. *Open Business Models: How to Thrive in the New Innovation Landscape*. Boston, MA: Harvard Business School Press, 2006.

11. J. Howe. *Crowd sourcing: Why the Power of the Crowd is Driving the Future of Business*. Random House, 2008.

12. D. Graham and T. Bachmann. *Ideation: The Birth and Death of Ideas*. John Wiley and Sons, Inc. 2004.

Recommendations in Lee's report include using the ideation program as a vehicle to rein-vent the agency, measuring the impact of programs, and learning from other agencies and industries.

Challenges. A related mechanism for stimulating innovation is a prize competition, or challenge. Challenges can serve as useful complements to more traditional development programs, with particular applicability to problems that entail high-risk R&D, requires unconventional approaches, or necessitate drawing on external resources.

Several pragmatic considerations demonstrate the value of competitions. First, competitions function as a hedge against risk because only the winner is rewarded. Second, the first-across-the-finish-line approach greatly leverages the prize value, should competitors need to invest in order to innovate. And finally, with their extensive use of communications technologies, competitions can raise public awareness, spur crowd source development, and push development of government outside the beltway to anywhere in the U.S.

The America COMPETES Reauthorization Act of 2010 specifically allows for federal agencies to conduct prize competitions to stimulate innovations that advance their missions. The website Challenge.gov, launched in September 2010, arose from this legislation and exemplifies how competitions can engage and empower citizens to help the government address problems in innovative ways.

Challenges often employ crowd sourcing to solicit solutions for specific problems, connecting citizen innovators with government implementers. A simple yet effective platform, Challenge.gov has launched over 400 competitions, awarded over \$120 million in prizes, and drawn on the talents of more than 150,000 participants in support of over 75 federal agencies in its first five years.

The Innovation Life cycle

A model for the innovation life cycle includes identifies the following stages:¹³

- **Stage One:** Idea Generation and Mobilization—Focusing on the birth of the initial idea generation and its surfacing through the organization
- **Stage Two:** Advocacy and Screening—Championing the innovation and evaluating assessing how well it meets current and future needs
- **Stage Three:** Experimentation—Testing, refining, and evaluating the innovation
- **Stage Four:** Planning—Converting the idea into a realizable solution for internal and/or external stakeholders
- **Stage Five:** Diffusion and Implementation—Spreading the word about the innovation and helping stakeholders begin to use it put it to use

Underlying this model are five central beliefs:

- First, most organizations are far better at generating innovative ideas than they are at bringing idea to fruition. Potential innovators become frustrated with a work environment that encourages employees to be inventive, but fails to support the innovation process.
- Second, rather than springing fully formed from a dedicated innovation lab or office, most innovations materialize from the experiences and insights of employees in the field through a “ground up” process. Nevertheless, each innovation requires support from all parts of the organization if it is to be meaningfully implemented. We are not dismissing the many discoveries that originate in innovation offices, but the fact remains that most new ideas are field-based.
- Third, innovation is not an event; rather, it is a process. New ideas are continuously formed, validated, and implemented throughout the budget year, and it is both problematic (and unproductive) to “hold” ideas until some predetermined time. Thus, mechanisms intended to foster innovation must operate continuously.
- Fourth, very rarely does an innovation leap into being fully formed. Most innovations surface in a raw state and need to be processed and refined before they can be suitably evaluated and implemented. The innovation life cycle provides that processing.
- Fifth, not all innovations are created equal. They can be short-term operational innovations, tactical renewals, or strategic overhauls. The size of the innovation and its potential impact may imply a much longer (or shorter) refinement process.

The innovation process can be visualized as an hourglass: It starts broadly (lots of people generating many ideas), narrows in both the number of ideas and number of people involved (during refinement (advocacy, screening, and experimentation), and then widens to involve more people in the organization during implementation. Thus, many people are involved in creating and using innovations (top and bottom of the hourglass), but only a relatively small number are involved in evaluating the suit-ability of each potential innovation.

Each stage in the innovation life cycle is discussed in detail below.

13. These stages and their descriptions are largely derived from Dr. Kevin Desouza's 2011 book, *Intrapreneurship: Managing Ideas Within Your Organization*. Detailed descriptions of each stage can be found there.

Stage One: Idea Generation and Mobilization

In this phase, a substantial number of people contribute to the generation of innovative ideas that are collected, refined, and ultimately narrowed down to the best proposals. It is impractical and inadvisable for an organization to expend resources equally on all ideas; this stage is designed to ensure the capture every idea and then, based on some initial refinement, selection of those that are most workable and appropriate. Many innovative ideas are “nice to have,” but fail to rise to the level of improving the organization.

It is essential during this stage to identify the potential user of each innovation, as the value of any innovation is ultimately based on its value to the user. We note that this potential innovation user could be anyone, including the innovator, the agency, other agencies, and, citizens. It is not uncommon for an idea to have multiple potential users.

For example, Darren B. Ash, Chief Information Officer at the U.S. Nuclear Regulatory Commission (NRC), describes a proposed innovation that would enable on site field personnel to capture and analyze data more quickly. While this innovation was initially targeted toward field investigators, Ash came to realize that the management back end was potentially more important, and he brought the management group in as a key user of the technology. In short, it is the data—not the device—that is important, and this fact surfaced during the mobilization phase. This case highlights the importance of carefully considering all of the potential users of an innovation.

Stage Two: Advocacy and Screening

In this stage, the idea moves from the hands of the innovator into the larger ecosystem of the organization. Others become involved in screening the idea, assessing its value and, if it is found to have merit, advocating for its development and implementation. NRC’s Ash describes this as “ensuring that the juice was worth the squeeze:” the final implemented innovation must be worth the effort to bring it to fruition.

It is easy to get trapped in this phase, or as the Peace Corps’s Andrews puts it, “to engage in paralysis through analysis.” The amount of screening should be directly proportional to the magnitude of the change: operational innovations require much less scrutiny than strategic innovations. The purpose of screening is to develop a preliminary business case for the idea. If the idea has a positive business case, it moves forward. If the business case is negative, the innovation is paused until it can be improved or business conditions change.

Stage Three: Experimentation

Once an innovation has a positive “first cut” business case, it moves into the experimentation phase, during which it is more closely examined and refined. It is at this point that the organization becomes fully involved in developing and improving the innovation.

This is also the stage during which the idea moves out of the employee’s ownership and into the organization’s ownership. The organization puts its full might behind the idea to determine its appropriateness and resilience to a variety of business conditions. Clearly, a strategic innovation will receive much greater scrutiny than an operational one.

For example, NRC’s Ash describes the existing reach-back capability for field inspectors as limited to calendar information, minimal content, and e-mail. Employees noted that they should be able to manipulate documents and add multimedia content to shared servers directly and immediately on site using a portable device, rather than merely taking field notes to be transcribed when back at the office or hotel. Ash sponsored a three-month pilot implementation that armed 50 field users with an array of new capabilities prior to refining the final, deployable suite. This preliminary experiment enabled the organization to “shake out” the idea before implementing it throughout the organization, thus maximizing the likelihood of a successful deployment.

Case Study: Innovation in Technology at the Peace Corps

The January 2010 report from the Office of the Inspector General (OIG) to the Peace Corps was highly critical. The report stated that the Peace Corps “... [did not have] an effective IT governance process as required by the Clinger-Cohen Act of 1996 and OMB Circular A-130.” It also lacked, among other things, an information resource management strategy, an IT road map to guide future decisions, criteria for prioritizing and selecting IT investments, and a standard methodology for monitoring and evaluating project costs and schedules. According to the OIG, these circumstances had led to “...[management lacking] the necessary information to make informed IT planning and budget decisions,” “offices [making] short-term decisions that did not ensure the most efficient and effective use of information resources,” “management [failing to] plan high priority initiatives and [failing to] allocate sufficient resources to fulfill federal IT requirements,” and “project managers frequently [allowing] IT projects to exceed budget estimates and miss scheduled milestones.”

In short, the Peace Corps’s Office of the CIO was in disarray when Dr. Dorine Andrews accepted the CIO position. In this role, Andrews, along with her 90-plus-member team, was charged with turning the office around to dramatically improve the agency’s information technology solutions at headquarters, at regional offices, and in over 65 countries worldwide.

One of the major innovation initiatives spearheaded by Andrews was the Global Reinvention Infrastructure Deployment (GRID) program. This initiative significantly decreased costs associated with technology upgrades at Peace Corps posts around the world. More importantly, it reduced deployment time from three years to 18 months, swiftly bringing all international stations onto the same (greatly improved) infrastructure and systems. According to Andrews:

“Before, we would send the stations [posts] the parts needed for their technology infrastructure and have two of our headquarters IT specialists go to assemble it. With GRID, we sent an assembled infrastructure that is simply maneuvered into position by the station’s IT specialist and then, remotely, the headquarters IT specialists in the United States transferred and tested the applications and data on the new infrastructure.”

The program was initially implemented in the Inter-American Pacific (IAP) region, but it has since expanded worldwide. GRID infrastructure—storage, servers, power, security, etc.—is all-inclusive, built in the U.S., and shipped as a single unit. According to Andrews, this initiative has been a huge time-saver for her staff, has resulted in a significant decrease in technology-related outages, and has eliminated a great deal of tedious work through automation.

Field staff now have 24-hour support, thanks to six regional IT specialists who support stations both close to and far from headquarters. Station personnel have been empowered to train their own staff, share field-based solutions among themselves instead of just with HQ engineers, and appropriately balance unique station needs (e.g., lack of consistent Internet connectivity) and global standards (e.g., standard interface,

Stage Four: Planning

It is in this stage that the detailed planning to take the innovation to scale occurs. At this point, the organization is fully committed to the idea and is engaging in the rigorous process that will lead to its implementation. It is critical that unintended consequences of the idea are considered during this phase.

For example, the Peace Corps’s Andrews describes a development and deployment strategy for a previous field station communications/IT suite that proved costly. Mini-data centers were engineered for each station by region, with installation and training conducted on site by fly-in headquarters personnel. Customization was extensive; a single regional deployment took over 12 months. Furthermore, the engineering team upgraded the technology before each deployment. The result was a unique architecture for each region, with

significant installation and operational expense.

As the new CIO, Andrews re-envisioned the “refresh” approach by shipping a product—not parts—to the field stations, increasing virtualization, and using “over the wire” connectivity to transfer software applications and data on a single, standardized technology platform. Although the previous approach had produced a highly customized platform for each region, it had slowed the agency’s ability to deploy those platforms and engineer solutions. As a result, it greatly inflated the cost of deployment and required more IT staff at both U.S. and field sites, all of which had unanticipated maintenance consequences.

As a result of Andrews’s overhaul of “refresh” methodologies implementation time across the three regions was cut in half (18 months instead of 36 months), field staff were empowered to do their own training and maintenance with testing manuals, the organization as a whole was better positioned to take advantage of new technologies. The big lesson learned was that the engineering team, like many teams, had become stuck the comfort zone of past practices. Andrews had to push them toward innovation with a new vision that was both feasible and affordable.

Aspects to be considered during the planning stage include the timing for implementation of the innovation, the best people to perform the implementation, the contracting approach (if any), and the question of ownership of the innovation. If necessary, any required funding is also identified, secured, and allocated.

Stage Five: Diffusion and Implementation

In this stage, the idea is implemented and then diffused throughout the organization to potential users. This stage is often the most challenging, because only now are reluctant adopters pushed to make a change. To address this difficulty, the organization needs a strong change management plan to accompany the innovation. Additionally, if users will include people outside the organization, a publicity push should be central.

As an example, we note that many agencies are now on the path toward cloud infrastructure. FCC CIO Bray recognized that the maintenance cost and resiliency posture of the commission’s numerous legacy systems could be improved by moving these systems to a public cloud environment instead of attempting on-premise, system-specific upgrades. Such a shift would also necessitate moving away from the 1990s’ app-centric world of the to embrace a more modern, data-centric, virtual-computing world. Bray realized that the shift would represent a significant culture change at the FCC, requiring a phased approach. His plan include quick wins to minimize resistance, followed by a dramatic physical move of all remaining systems to the cloud or a commercial service provider to achieve the desired budgetary benefits.

Innovation Using Change Agents and “Software as a Service” at the Federal Communications Commission

When he first stepped into his role as FCC CIO, Dr. David Bray knew he faced a challenge. There had been nine CIOs in the eight years prior to his arrival, and previous efforts at innovation proven unsuccessful. As a result, many among the FCC IT staff feared and even anticipated failure. While the senior leadership at the FCC was fully supportive of innovation, the staff was reluctant.

Undeterred by that reluctance, Bray embarked on numerous innovation efforts. In one such effort, recently publicized by Forbes and others in the popular press, he confronted the need to replace the FCC’s 15-year-old consumer help desk.

Bray and his team researched what other agencies had done and discovered that, according to private sector estimates, it would cost \$3.2 million and take almost two years to install a new in-house system recommended as the gold -standard by other agencies. By going instead to a “Software as a Service” (SaaS) source, Bray and his team of “change agents” got the system up and running at one-sixth the projected price (\$450,000) and in less than half the time. The new system has the additional advantage of being hosted in the cloud versus on-site. In this way, the FCC leveraged the resources and security that were already part of the vendor’s services, rather than trying to invent them anew within the agency.

After achieving that “quick win” with the consumer help desk transformation, the FCC achieved similar wins by moving other systems to the cloud in similarly accelerated time frames—usually at one-sixth to one-fifth the price of on-premise implementations and in half the time. These successes led in turn to a bold effort in September, in which the FCC team, as part of their “Operation Server Lift,” moved all remaining on-premise systems to either the cloud or a commercial service provider to realize maintenance cost budgetary benefits. Specifically, the FCC’s operations and maintenance (O&M) expenditures shrank from an 85 percent share of its 2013 budget to less than 50 percent of its budget in subsequent years. Compare that figure to the average O&M budget share of more than 80 percent recently reported by the U.S. GAO and Federal CIO.

Even with this leadership and measurable success, according to Bray, there were still those within the vendor community who wanted to follow the traditional software development and on-premise procurement approach for IT systems. Bray therefore believes that any senior executive needs to be both “a digital diplomat” and “a human flak jacket,” to encourage staff to be bold and experiment with new ways to deliver faster, more effective business results.

A major shift in the FCC’s organizational culture, central to the transformation Bray and his team led, was empowering bottom-up “change agents,” granting those agents opportunities to pitch new ideas, bring data to support these ideas, and move forward with speed to transform the FCC out of its legacy IT environment. Bray focused heavily on creating an organizational culture that encouraged and supported creative problem solvers. They would be empowered to take action to resolve long-standing issues, and they would be held accountable for any failure to address issues within their domains, with the backing and willingness of the CIO to “take flak” if friction arose.

As Bray says, for innovation to be successful, change needs to be bigger than just the CIO, and requires an entire team willing to take some informed risks to break past the status quo. Bray also emphasizes that a diversity of opinions across existing and new staff—as well as government and contracted staff—is both helpful and healthy for any organization. He notes that any executive leader needs a network of change agents throughout the organization who will embrace and support innovation. This is not to suggest that change agents need to blindly support innovation data on why an effort is worth pursuing is always helpful, but must be placed alongside a discussion of the risks, potential alternatives, and complementary approaches.

For his cloud computing “quick win,” Bray led a team that modernized the 15-year-old legacy consumer help desk at one-sixth the capital cost and one-sixth the ongoing operating cost of a comparable on-premise system. The new system also proved easier to use for both the public and FCC, reducing the time required to investigate issues of public concern.

As Bray notes, it is easy to focus on infrastructure costs and ignore the time and human effort costs associated with legacy systems. These costs include the time required of the public and practitioners to use a system, time required to analyze data in a system, and time required to patch and maintain an aging legacy system. Such costs are all “below the waterline,” akin to the hidden bulk of an iceberg, weighing down an organization in ways far beyond ongoing maintenance costs. To overcome this inertia, Bray encourages an entrepreneurial “startup mentality” within the organization to escape legacy burdens.

At the FCC, Bray champions what he calls positive “change agents” entrepreneurial actors on the inside of an organization with autonomy to identify problems and propose solutions, measure progress on their self-led efforts, and focus on meaningful missions. As CIO, Bray encourages these positive change agents to focus intently on the organizational and human aspects of business outcomes achieved by technology.

Bray’s leadership highlights another issue associated with diffusion and implementation: federal CIOs need to be actively involved in championing ideas from within their units, and they must find champions (advocates) among their peers for new technology innovation. The federal government has evolved far past the “technology for technology’s sake” mentality, and finding strong advocates from outside the unit is critical. Bray encourages CIOs to be bold, experiment, and act as “venture capitalists on the inside” of their organizations.

The State of CIO-Driven Innovation: Challenges from the Field

This section details the most significant challenges that agencies and departments face in attaining repeatable innovation. While not all challenges are seen in every agency or in every stage, most are, and overcoming them is key to creating ongoing innovation.

Challenge One: There Is Insufficient Buy-In From Key Players

One of the biggest challenges in enacting innovation is overcoming the heroic myth of a single person slaving away in isolation to create transformative change. Fueled by stories of companies started by founders in garages or dorm rooms, government and industry often succumb to the romantic idea that true innovation is a solitary endeavor.

Perhaps as a result of the “hero” myth, some agencies have adopted a skunk works approach to innovation by establishing an innovation office. Such an approach—modeled after Lockheed Martin’s Advanced Development Programs (ADP)—identifies and isolates talented people, with the expectation that once the shackles of oversight and administration are removed, innovation will naturally occur. What is often overlooked in this model is that to meet its goals, an organization still requires active management by agency leadership, including provision of a mission, objectives, resources, and top-cover.

Because this approach has had some success in industry, some agencies are adopting it without fully implementing the necessary oversight and support structures. In these agencies, a few undeniably talented people are isolated and directed to be innovative. While good ideas have emerged, they have generally wilted in isolation without needed support and the wisdom of other key players in the agency. Further, these ideas were often out of sync with the realities of current operations, budgets, or technology. As a result we caution that while innovation offices may be successful, they need to be thoughtfully constructed and not exclude innovation by others within the organization.

As Renee Wynn, CIO at two federal agencies, observes, “If you make innovation someone else’s job, no one else worries about it.” By isolating the innovation function, agencies can lose the greatest innovative asset they have: the many thousands of employees who have direct contact with citizens and the programs being delivered, and who are the engines of idea generation and mobilization. Although we see the value of an innovation office within an agency, it is not a mandatory condition for effective innovation.

In short, one of the challenges of creating innovation in the federal government is ensuring that key players are involved—early and often—in the innovation process, as innovation is too often seen as a leadership responsibility. This challenge persists through the entire innovation process and in every stage of the innovation life cycle model.

Challenge Two: Current Levels of Process Discipline Are Inadequate

Not surprisingly, process discipline is often lacking, which ties in neatly with our first challenge. While everyone we spoke with is very supportive of the need for innovation, few agencies have a defined and repeatable process for enacting innovation. Often, the person who generates an idea is unaware of any procedure to act upon it, and either tries to create a process ad hoc or simply gives up trying to move the innovation forward. Sylvia Burns, CIO at the Department of the Interior, notes that IT-enabled innovation bubbles up, but support needs to be implemented from the top down. This model allows corporate IT to pick the tool sets and standards, while allowing IT-based innovation to flourish in bureaus and field offices.

As a result of the lack of process, potentially workable ideas are routinely developed then discarded before any official, rigorous screening has even occurred. Numerous interviewees told us stories of outstanding innovations that were created but never implemented due to ignorance of the process or fear of failure. West says, “Governments are not always good about failure; people get punished for it.” West pushes for more agile methods that would allow innovators to “fail fast” and learn from experience, and for a mechanism for “bold leadership” to create good business cases and move innovative projects forward as quickly as possible within the constraints of government.

Interestingly, most of the agency leaders we spoke to are aware of this issue and told us stories of innovations that languished in obscurity until leadership learned of them—often by chance—and brought them to fruition. The function of championing the idea is often performed well once identified, but it is probable that an innovation will be discarded without the direct and forceful involvement of the CIO.

In one example, NRC’s Ash notes that the requirement for a mobility-enabled intranet to allow employees to access essential documents while conducting on-site activities was well known in the field, but the idea had not made it to the agency level. Ash was approached directly by a staff member to consider the innovation; a subsequent meeting was arranged and the project’s direction changed as a result. Noting that this type of extraordinary intervention should not be necessary, Ash explains that he works to create a more open and collaborative environment with a new culture of change, allowing for innovation to rise through the organization to the advocating and screening stage.

As this case and many others shared by our interviewees demonstrate, innovative ideas are often only implemented if the CIO becomes aware of the innovation and personally spearheads its implementation.

Challenge Three: Agencies Lack the Means to Determine the Value of Innovation

Virtually all of the agencies we met with had the same problem: how to determine the value of a potential innovation. While all agencies acknowledge the challenges of government accounting, most lack a clear and concise way to determine if an innovation is worth implementing.

Interestingly, there is little difficulty in determining the cost of an innovation; most of our interviewees spoke with great confidence about the direct and indirect costs necessary to bring an innovation to fruition. Additionally, most are comfortable with identifying the non-quantifiable benefits and risks associated with the innovation.

In describing her process for calculating the business case for an innovation project during screening, NSF’s Northcutt observes that, “The ROI equation does not transfer well to the government setting, as the variables do not translate.” She researched the major consulting firms and then asked other CIOs on the CIO Council what they did for evaluation and weighting. In their responses, they all sounded the same refrain: it is very difficult and we don’t have it worked out yet. What was required was an agency-specific method, as value is often context-dependent.

In both the experimentation and planning stages, the challenge is to accurately identify the quantifiable benefits and risks associated with the innovation. Because of the uncertainties inherent in that process with the tools currently available, innovators have a great deal of difficulty convincing senior management of the wisdom of the innovation. It is not that senior management is against innovation. On the contrary, senior management encourages innovation but needs a supportable case to make the right business decision. Lacking the ability to calculate the value of the innovation, many innovators simply abandon the project, even when it intuitively appears valuable.

Challenge Four: Procurement Rules Inhibit Quick Wins

While funding can be a problem within the federal government, procurement rules a greater challenge. Most agencies express frustration with their ability to quickly attract and retain the skilled external consultants needed to implement an innovation, particularly if it is tactical or strategic, rather than straightforward and operational.

Agencies are equally frustrated with antiquated and often byzantine acquisition rules and procedures. Once a potential innovative project is selected, acquisition becomes a major challenge throughout the phases of experimenting with the initial concept, scaling it up for commercialization, and extending it to full-scale implementation across the agency.

The Peace Corps' Andrews says it is important to bring in external parties to assist with innovation, but observes that procurement rules can hinder the process.. She offers the example of hiring software development personnel trained in agile methodologies, noting the length of time it took to bring them in. In her words, "Federal contracting is its own world." Frustration stemmed from an agency procurement process that took 18 months and produced inches-thick procurement documentation for a \$50,000 contract.

NSF's Northcutt notes that acquisition tends to be very conservative, and that agency leadership must therefore partner with acquisition and work within its regulations and strictures. Northcutt stresses that the system is not necessarily broken—it can and sometimes does work—but it is extremely laborious, requiring exceptional attention to detail and a great deal of patience.

The heart of the problem lies in the fact that innovations spring up as fresh ideas, and many existing contract vehicles are simply not designed to accommodate something truly new. As a result, the agency is left to either use an existing but ill-suited consultant to do the work, or to process the paperwork to engage a suit-able contractor. This process can take many months, and as a result, many potentially innovative ideas lose momentum and are abandoned due to procurement issues.

Challenge Five: Few Metrics Are Kept

Finally, very few metrics appear to be kept on innovation, and this stymies the growth in the understanding of both the effectiveness of the innovation process at each agency and the issues associated with that process. This is true at every stage of the model. As a result, most work on innovation is based on "best guesses" from those involved in the process. The CIO of one agency notes that no innovation metrics of any sort are used or tracked there, and that they are "pre-metric" with no plans to get there."

However, innovation metrics are critical indicators of the future status of the IT function, as they can be used to track relevance in the face of technological change.¹⁴ The full life cycle cost of IT and how to measure it is another issue of concern. As NRC's Ash expresses, "We buy a lot of cute puppies, but they get big and expensive to feed." There is an inherent trade-off, as every innovation that introduces a system has to have an offset or a specific budget line to account for it. Assessing such trade-offs requires excellent estimation and measurement skills. Yet the need for such assessment grows ever more critical, as the technical debt associated with legacy systems is growing rapidly and must be addressed with innovative solutions before it becomes insurmountable.¹⁵

14. Further discussion of innovation metrics can be found in the VIDERITY Center report *Creating a Balanced Portfolio of Information Technology Metrics*, by Kevin C. Desouza.

15. See 18F discussion of the risks of technical debt at <https://18f.gsa.gov/2015/08/07/technical-debt-1/> and <https://18f.gsa.gov/2015/09/04/what-is-technical-debt/>.

Ideally, detailed metrics should be kept at every step. In fact, Army Deputy CIO Wang does just that. His metrics track inputs, processes, and outputs, and are divided among resource, capability, and leadership views. For example, a question in the capability view of inputs was, “What percentage of employees have been trained in innovation?”; one in the leadership view of processes was, “Is senior leadership directly accountable for the organization’s innovation processes?”; and one in the resource view of outputs was, “What is the innovation revenue per employee?” We can quite easily envision this resource-capability-leadership scheme being applied to the five-stage innovation model with great success. Wang’s approach represents an excellent use of metrics; similar approaches should be adopted by all organizations within every stage of the innovation life cycle. However, this case was an outlier in our interviews, as most agencies do not track any metrics associated with innovation.

The Promise of CIO-Driven Innovation: Findings from the Field

Five key findings emerged from our interviews:

- **Finding One:** Chief information officers recognize the value of innovation
- **Finding Two:** Examples of innovation and innovative practices abound
- **Finding Three:** Challenges are not insurmountable
- **Finding Four:** Innovation occurs in an ecosystem
- **Finding Five:** Leadership can foster innovation-oriented culture

Finding One: Chief Information Officers Recognize the Value of Innovation

Everywhere we interviewed a CIO, we received the same message: innovation is core to the survival of the agency, and without it, agencies will be unable to meet future obligations. This theme is echoed across all levels of the organization and by all stakeholders. The emphasis on getting innovation right is prominent in strategic plans and resonated throughout our conversations. Renee Wynn notes the importance of the reflective aspect of innovation, stating, “Innovation is taking a pause in how you are doing business to look at what you are doing.”

Similarly, CIOs recognize their own centrality in finding innovative practices. West notes that innovation suffers when leadership is uninspired; an agency needs “bold leadership” to insist on a good business case for innovation, and to mandate that the process be executed with discipline. He sees this as the most important part of a CIO’s job.

We hasten to note that even if an agency has an innovation office, there is still considerable need for the CIO to be heavily involved. The success of IT-enabled innovation requires the technical and strategic expertise of the CIO; without it, an innovation office is unlikely to successfully implement IT-enabled projects. Our CIO respondents recognize the need to innovate, and that alone facilitates improvement.

Finding Two: Examples of Innovation and Innovative Practices Abound

Rather than encountering a landscape bereft of innovation, we found excellent examples of innovation at every agency we visited (see sidebar descriptions of innovation at the Peace Corps and the Federal Communications Commission). Many of those interviewed could point to numerous innovations that had taken root in their organizations and could describe the process by which each one came to fruition. Processes may have been inconsistent, but innovation has not been stymied by lack of ideas. Rather, the primary hindrance is a lack of adequate follow-through—a much more easily solved problem.

One common innovation being pursued as a necessity by most agencies is the move to cloud computing. One CIO cites a cloud transition requirement that stems from a mandate from their new agency head, who discovered that sending an e-mail to all employees required 12 different systems. Another notes the security issues associated with data centers and the likelihood that cloud computing would improve their security posture. A third highlights the decreased capital and personnel investment in the cloud, making it scalable through operating funds. Regardless of the impetus, diverse agencies are converging on specific technologies and approaches to innovation in this area.

Innovative practices generally span organizational levels, as they require close coordination among teams

within a federal department or agency. The Department of the Interior's Burns notes that her strategy for innovation is all about building relationships with other executives, a process that starts with listening to their problems, building rapport, and then suggesting innovations. She notes that simply going in and offering suggestions for innovation is unlikely to work without an established relationship and an understanding of the salient business problem.

While no agency incorporates all best practices for innovation, all agencies have pieces of best practices within their methodologies. This reality suggests that there is nothing systemic in the federal government to obviate the ability to be innovative. It is far simpler to assemble best practices than to create them.

Finding Three: Challenges Are Not Insurmountable

Our interviewees commented that lack of funding and lack of interest are often the twin killers of innovation. Based on our interviews, however, we did not find these "killers" present in the agencies. CIOs, staff, and external stakeholders are all interested in seeing innovation flourish. And although budgets are indeed always tight, no agency sees funding as a major impediment to successful innovation. In fact, most agencies point out that successful innovation often offers a net cost savings, so that funding is not an obstacle.

As evidence that challenges can be surmounted, steps have been taken to address issues in procurement. The Federal Information Technology Acquisition Reform Act (FITARA) was specifically designed to drive efficiencies and cost savings in acquisition, and to trim the waste and losses seen in failed IT programs. Actions such as the establishment of the Federal Commodity IT Center and the designation of Assisted Acquisition Centers of Excellence will go a long way toward improving coordination and engendering low-cost acquisition practices. As focal points for commodity IT, they represent a method for aggregating federal government demand in order to realize economies of scale.

At the other end of the spectrum, the 18F-created Agile Delivery Services Blanket Purchase Agreement (Agile Delivery BPA) is intended to streamline and simplify federal government access to specialty vendors. Far from commodity IT, this initiative allows agencies to accelerate their delivery of new services by establishing a streamlined and common contracting vehicle to bring technological resources to bear on their agency-specific requirements.

CIOs are uniformly hopeful and positive regarding their agencies' ability to increase opportunities for innovation, and consistent in their desire and effort to search out those opportunities. Within the context of the Army, for example, Wang emphasizes that while government policies and processes are fixed, people can actually get far more done than they expect by knowing those processes well. NSF's Northcutt also echoes this theme and suggests that a detailed knowledge of the processes and policies of federal procurement would often yield a workable solution.

Finding Four: Innovation Occurs in an Ecosystem

While all agencies stress the importance of internal innovation, there is also broad recognition that many external players can and should influence outcomes. As one respondent notes, "Innovation can come from the top, bottom, and side, but open innovation within the organization is best."

The collection of bureaus, regions, and field offices within each agency constitute part, but only part, of the ecosystem.

Some CIOs are particularly good at devising innovation systems that will "fly under the radar of HQ." They recognize the value of the resulting innovations, but also the need to surface them and get them adopted across the agency. FCC CIO Bray says a diversity of ideas, generated by both long-serving employees within an agency and those who have just arrived, has been shown to lead to better performance outcomes. This cross-pollination can only occur in a participatory environment. Hence, a key component of successful innovation is to involve as many staff members at as many levels across as many parts of the agency as possible.

External innovation components include organizations such as USDS and 18F, small and large agency CIO councils, and focused programs such as the Presidential Innovation Fellows (PIF). CIO Wynn cites the Office of Management and Budget (OMB) and the Federal CIO Council as sources of innovation; NRC's Ash also credits

the CIO Council with providing multiple good ideas. The ability to set government-wide objectives and policy on technical issues was seen as valuable.

Several CIOs note the influence of USDS and 18F in breaking certain public service paradigms, and see significant value in these types of internal consultancies based on external industry best practices. The goal with external innovation is, therefore, to bring in change agents or new ideas to disrupt the environment of an agency, giving rise to the change opportunity. As Dr. Tyrone Grandison, Deputy Chief Data Officer at the Department of Commerce and former Presidential Innovation Fellow, notes, the benefit of the PIF program resides in introducing “non-agency irritants” to spur innovation. He likens the role of PIF to a grain of sand being inserted into an oyster.¹⁷

One of the most interesting examples of a valuable external player is the Office of the Inspector General. One CIO told us that she engaged the OIG numerous times to provide support for an innovation. By harnessing the power of the OIG, she was able to gather the necessary momentum to convince the agency’s executive leadership of the need for the innovation.

As with any other ecosystem, there is a balance to be achieved among the various actors involved. Innovations arise both internally and externally, so agencies should be sensitive to both avenues of opportunity.

Finding Five: Leadership Can Foster Innovation-Oriented Culture

As one respondent aptly puts it, “IT is easy, but culture is hard.” When asked about the source of innovation, another respondent stressed that “it’s not tech, it’s people.” The primary challenge is, then, people-based, as innovation can lead to restructuring, job loss or reassignment, new ways of doing business, and changes in interactions, power, or responsibility. Each of these potential outcomes is unsettling; employees might face them with trepidation or outright resistance, even hostility. Leadership needs to generate the trust and vision to be able to address these concerns.

Many of the major issues revolve around acceptance of risk and the possibility of failure. FCC CIO Bray notes that agencies have talented people who are willing to learn, but they have not been heard and empowered. He posits that within public service organizations, career employees have not been encouraged to take on high-risk/high-reward activities, and might even be penalized for going outside of the boundaries. Bray himself was willing to lead a transformation at the FCC because he perceived that the cultural state of affairs required an “intervention.” Bray was also willing to make the organization more effective in its services by serving as a “human flak jacket” for bottom-up, positive change agents.

West notes that he needed to create confidence in the workforce to initiate change, which in turn would fuel increased innovation, creating a positive feedback loop. He felt that he needed to spark a reimagining of the workplace narrative to encourage risk-taking in pursuit of innovation.

The culture of the federal government is already changing to take advantage of more openness in public service practices. Several CIOs note a significant shift toward the creation of a more innovative spirit within the IT community. Army Deputy CIO Wang notes that some people are naturally innovative, but innovation can be taught to anyone. However, more training opportunities are needed to learn the practice of innovation in public service. FCC CIO Bray emphasizes the importance of taking an open innovation approach and including everyone in organizational transformation. He says, “It doesn’t matter where the innovation comes from, but reward it and celebrate it, since it feeds a public service motivation goal.” Bray’s bottom-up change agents are entrepreneurial actors on the inside of his organization. They are given autonomy to identify and propose solutions to problems, tools to measure progress on their self-led efforts, and meaningful missions that carry with them a strong sense of purpose.

Donald W. Wynn, Renee M. E. Pratt, Randy V. Bradley, *Making Open Innovation Ecosystems Work: Case Studies in Healthcare*,

16. Washington, DC, 2015.

17. Grandison participated in the study in a personal capacity and was not speaking on behalf of the PIF program, the White House, or the Department of Commerce.

Recommendations for Fostering CIO-Driven Innovation

Based on our interviews, we set forth five recommendations for organizations to implement, or improve their implementation of, an innovation methodology. The realization of an innovation process is sparked by the agency director (to involve the key participants and set the culture) and the CIO (who is responsible for the enactment of the process itself).¹⁸

- **Recommendation One:** Agency heads should involve key participants in the innovation life cycle
- **Recommendation Two:** CIOs should assess current and desired levels of innovation maturity
- **Recommendation Three:** CIOs should create a formal process for enabling to advance innovation within their agencies
- **Recommendation Four:** Agency heads should foster a culture and space conducive to for experimentation
- **Recommendation Five:** CIOs should identify and implement appropriate metrics

Recommendation One: Agency Heads Should Involve Key Participants in the Innovation Life cycle

From our research, it appears that many innovations fail because the innovators are left to implement the innovation by themselves due to the lack of involvement of key individuals. The myth of the lone innovator has long been thoroughly -debunked. A community is needed to nurture innovation. However, as Bray (FCC) succinctly notes, accountability and responsibility can be too diffuse; the buck has to stop somewhere.

We suggest that the agency director serve as that place where the buck stops. It is clear that accountability for innovation needs to be with agency leadership, so it is incumbent upon the agency director to involve the key participants in the innovation life cycle. The agency director is most responsible for charting the organization's course and is in the best position to screen, select, and promote the best innovations in support of the organizational mission.

However, it is equally clear that the agency director has not cornered the market on good ideas, and must therefore endow employees with the power and the responsibility to generate and elevate innovation to management. Only when the vast experience of those in public service is tapped will the requisite number of potential innovations surface, ensuring that the best are selected for implementation. As NRC's Ash points out, the role of leadership is to stimulate innovation by "poking and prodding and asking questions."

One respondent stresses why innovation needs to start with the agency director in the simplest terms: "If [they] don't lead, it doesn't happen." Grandison (Commerce) notes that when he is starting a new innovation effort, his first discussion is with senior agency leadership to ensure that they are on board and involved. Said differently, innovation is unlikely to occur if agency leadership is not deeply involved.

As part of developing a process for innovation, it is important to identify the key players and define their roles. Only once this foundational work has been done can the remainder of the recommendations can be carried out.

18. In agencies with an Innovation Office, this responsibility could be assumed by that office if it is responsible for IT-enabled innovation.

Recommendation Two: CIOs Should Assess Current and Desired Levels of Innovation Maturity

Before implementing any major innovation process changes within the agency, it is important to know the current and desired maturity level. Innovation maturity can be achieved by adopting the Software Engineering Institute's Capability Maturity Model scale, of which the levels are:

- **Ad-hoc:** The organization lacks a defined and repeatable process for handling innovation and, if innovation occurs, it is largely because of the efforts of individual employees. While the organization may be quite good at generating innovations, few are actually implemented and no metrics are kept on innovation implementations or their effects. It is appropriate that this level is often referred to as chaotic.
- **Localized:** At this level, a few local instances of innovation processes are seen. However, instances in one region or division have very little in common with the instances at other points in the organization. That is, even if innovation occurs within one part of the organization, the innovation processes at other points within the organization may be entirely different.
- **Standardized:** At this stage, the first evidence of agency-wide innovation is seen and commonalities across the organization begin to emerge. Agencies at this level respect innovation and show serious commitment to successful innovation. Innovation processes are standardized, understood, and internalized across the organization.
- **Measured:** In this stage, the agency truly "gets" innovation. Agency-wide innovation processes are not only standardized, but also measured. Appropriate metrics have been selected and implemented for each step in the innovation process, and these metrics are suitable for every part of the organization.
- **Optimized:** In this stage, the agency adopts a continuous improvement approach to innovation to ensure that the process is continually refined and advanced. Processes and the metrics that capture their effectiveness are regularly revisited and considered against changing environmental conditions and agency goals.

Using a common scale for maturity assessment (current and desired) also facilitates bench-marking among agencies. By developing and utilizing a common maturity evaluation tool, agencies can know where they stand relative to other agencies and can share in improvement processes.

While the CIO (or agency Innovation Office) should lead this effort, representatives from throughout the organization should be involved in assessing the current and desired maturity of innovation within the agency. This process will naturally evolve from a purely academic exercise into a more practical examination of possibilities setting the stage for the creation a formal process for innovation (Recommendation 3). Such an assessment-centered approach allows agencies to share benchmarking data and exchange knowledge surrounding innovation processes and targets. It also clarifies the amount of monetary and human capital that the organization is willing to invest in the pursuit of innovation.

Recommendation Three: CIOs Should Create a Formal Process to Advance Innovation within Their Agencies

Once the maturity level is known and the key players are identified, the CIO can develop and roll out the agency's formal innovation process. While each step of the innovation process needs to occur regardless of the size of the innovation, the rigor that surrounds each step depends upon whether it is an operational innovation (most likely developed by field staff) or a tactical or strategic innovation. The CIO must make both the uniformity and the adaptability of the process clear. Operational innovations, which will likely comprise 90 percent of innovations within the agency, simply do not require the same level of rigor as other types. In fact, a highly rigorous process for an operational innovation is likely to stymie further innovation and create a perception of suffocating bureaucracy.

We caution that while similarities may exist in how innovation occurs at different agencies, it is unlikely the processes will be identical. We think this is appropriate; the innovation process needs to be tailored to the agency. One respondent notes that there is rarely a one-size-fits-all approach and stresses the need to modify the process to fit the situation. Adopting a six-sigma level approach may be appropriate in some cases, but a looser version may be more beneficial in other scenarios. Over time, we expect that each agency will refine its processes and share its best practices, allowing commonalities to emerge. We suggest that the appropriate forums for sharing best practices are the respective CIO Councils.

As with all changes in process, the CIO needs a suitable roll out plan and an appropriate change in management strategy.

Recommendation Four: Agency Heads Should Foster a Culture and Space Conducive to Experimentation

This recommendation may seem obvious, but it is vital to the success of the innovation process. Given that over 90 percent of innovations are likely to arise from field/bureau staff, it is important that the agency director create a culture of experimentation and shared discovery. While Google's "20 per-cent time" rule¹⁹ is unlikely to work within the confines of government, there is no reason for the agency director not to employ other means to encourage innovation, such as employee recognition programs. If agency personnel are allowed and encouraged to be adventurous, innovation is likely to flourish.

The agency director also needs to consider physical space for innovation. Building prototypes and proofs of concept requires offline facilities for experiments prior to pilot testing. This work may be done in engineering facilities, innovation labs, or architecture offices. Through review and experimentation, innovations may not progress beyond paper, or they may be fully integrated into system architecture. Either way, there must be a capacity to enact a build-test-build cycle without having a negative impact on agency operations prior to implementation.

Recommendation Five: CIOs Should Identify and Implement Appropriate Metrics

While we only encountered one organization that kept detailed metrics on the strength of its innovation process, all agencies, led by their respective CIOs, need to develop and track metrics to better manage the process. In designing a metrics process, the CIO needs to ensure that the right metrics are captured and used.

In general, the following thoughts should be kept in mind:

- First, the goals of the agency need to be clear before metrics are developed, and the metrics need to be closely linked with the agency's strategic IT plan. It is helpful for the CIO to have a variety of agency stakeholders involved in the identification of potential metrics and their benchmarks, to ensure that the metrics selected are insightful and can be captured. In general, it is helpful to have fewer and less complex metrics. Such clarity also helps promote an understanding of how innovative the agency needs to be and how much it is willing to spend on innovation.
- Second, as the system of metrics is implemented, the CIO needs to communicate with the stakeholders regularly on both the achievement and the failure to achieve key metrics. This transparency is important to ensure that the metrics are not being gamed and are being thought-fully applied to drive changes in the process.
- Third, the CIO needs to periodically revisit and revise the metrics in order to ensure that they are not simply being kept for the sake of keeping metrics. At a regular interval (we suggest quarterly), the CIO should examine metrics for effectiveness and appropriateness, and make any needed revisions.

19. Google employees were famously allowed to use 20 percent of their work time for innovative projects of their own choosing, although this program has recently been curtailed or eliminated.

Illustrative Metrics to Assess IT Innovation

<p>Personnel</p>	<ul style="list-style-type: none"> • Budget allocated to training and development, especially on new technologies, programs, and practices dealing with IT management and governance • Number of times senior IT leaders are invited to participate in strategic projects of the agency • Number of projects where IT is playing a leadership role • Number of ideas submitted by employees (over 30, 60, 90 days) • Amount of knowledge increased • R&D budgeted project funding per employee
<p>Projects</p>	<ul style="list-style-type: none"> • Number of experimental projects underway with emerging technologies • Number of successful new business processes re-engineering projects completed • Planned value • Earned value • Actual cost, to date • Project success rate • Project change success rate • % Late • % Over budget • Total scope of changes • Average scope of changes per project
<p>Projects</p>	<ul style="list-style-type: none"> • Amount of budget spent on new IT projects • Amount of budget spent on prototyping and experimenting with emerging technologies • % of IT budget spent on innovation when compared to overall % of agency budget spent on innovation
<p>Stakeholders</p>	<ul style="list-style-type: none"> • Number of awards received from associations, magazines, forums, etc. • % of IT workforce on strategic agency projects. • % of CIOs and key functional managers' time spent on charting the future (strategic innovation) rather than on day-to-day operations • Membership on advisory boards • Number and quality of innovative strategic engagements with academia, NGOs, and the private sector

Appendix: Methodology

The authors conducted interviews with current or former information technology officials, federal government innovators, and agency staff. In all, 20 people were interviewed and detailed notes were kept from each interview. Permission to use the interview notes was granted by all of the interviewees and, in several cases, follow-up communications were used.

Interview Questions

The interviews were semi-structured, with the following questions:

Agency level questions

- How would you describe the mission of your agency?
- How well do you think your agency is currently performing its mission?
- How important is technology for the achievement of your mission?
- How would you describe your technology strategy to support your mission?

Innovation questions

- How do you define innovation within the context of your agency?
- How important is innovation within your agency?
- Of the innovations that you have implemented, which one are you the most proud of? Why?

Innovation success questions

- What do you think are the most important factors necessary to create successful implementation at the federal level? Why?
- How important is and how do you manage the involvement of: the agency director? Other C-suite executives? End users? Congress? Tech staff?
- What are the biggest impediments to successful innovation at your agency? Why?
- As CIO, how do you personally contribute to innovation at your agency?

List of Those Interviewed for Project

Federal Agencies

Federal Communications Commission: David A. Bray, PhD, Senior Executive and Chief Information Officer, Information Technology Center

National Science Foundation: Amy Ann Northcutt, Chief Information Officer, Office of Information and Resource Management

Peace Corps: Dorine Andrews, PhD, former Chief Information Officer

United States Department of the Army: Gary C. Wang, HQDA, Deputy Chief Information Officer/G-6

United States Department of the Interior: Sylvia Burns, Chief Information Officer; Jerry Johnson, PhD, Director, Information and Technology Management Division; John Montel, Deputy Director, Information and Technology Management Division

United States Nuclear Regulatory Commission: Darren B. Ash, Chief Information Officer, Office of the Chief Information Officer

White House Presidential Innovation Fellows: Tyrone Grandison, PhD, Deputy Chief Data Officer at the Department of Commerce and former Presidential Innovation Fellow

Other

Barry C. West, former Chief Information Officer at five agencies

Renee Wynn, Chief Information Officer at two federal agencies

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