



IBM Center for
The Business of Government

Innovation Series

A Playbook for CIO-Enabled Innovation in the Federal Government



Gregory S. Dawson
Arizona State University

James S. Denford
Royal Military College of Canada

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Gregory S. Dawson
Arizona State University

James S. Denford
Royal Military College of Canada

Table of Contents

Foreword	4
Executive Summary	6
An Introduction to CIO-Enabled Innovation in Government	8
Federal Policy and Structures Supporting Innovation	9
Trends in CIO-Enabled Innovation in Government	11
The Innovation Lifecycle	13
Stage One: Idea Generation and Mobilization	14
Stage Two: Advocacy and Screening	14
Stage Three: Experimentation	14
Stage Four: Planning	16
Stage Five: Diffusion and Implementation	16
The State of CIO-Enabled Innovation: Challenges from the Field	19
Challenge One: Lack of Buy-In From Key Players	19
Challenge Two: Lack of Process Discipline	20
Challenge Three: Inability to Determine Value of Innovation	20
Challenge Four: Procurement Rules Inhibit Quick Wins	21
Challenge Five: Few Metrics Are Kept	21
The Promise of CIO-Enabled Innovation: Findings from the Field	23
Finding One: Chief Information Officers Recognize the Value of Innovation	23
Finding Two: Examples of Innovation and Innovative Practices Abound	23
Finding Three: Challenges Are Not Insurmountable	24
Finding Four: Innovation Occurs in an Ecosystem	25
Finding Five: Leadership Can Foster Innovation-Oriented Culture	26
Recommendations for Fostering CIO-Enabled Innovation	27
Recommendation One: Agency Heads Should Involve Key Participants in the Innovation Lifecycle	27
Recommendation Two: CIOs Should Assess Current and Desired Levels of Innovation Maturity	28
Recommendation Three: CIOs Should Create a Formal Process for Enabling Innovation Within Their Agencies	29
Recommendation Four: Agency Heads Should Foster a Culture and Space for Experimentation	29
Recommendation Five: CIOs Should Identify and Implement Appropriate Metrics	29
Appendix: Methodology	31
About the Authors	33
Key Contact Information	35

Foreword

On behalf of the IBM Center for The Business of Government, we are pleased to present this report, *A Playbook for CIO-Enabled Innovation in the Federal Government*, by Gregory S. Dawson, Arizona State University, and James S. Denford, Royal Military College of Canada.

Innovation plays a key role in government transformations at all levels. In the federal government, for example, agencies have begun to designate chief technology officers, chief innovation officers, chief data officers, entrepreneurs-in-residence, and similar roles to promote new approaches to innovation. But because many innovations are rooted in the use of technology, agency Chief Information Officers (CIOs) can play a strong role as well. Furthermore, the new Federal Information Technology Acquisition Reform Act creates a statutory requirement for CIOs to help lead agency IT innovation efforts.

For this report, Drs. Dawson and Denford interviewed nearly a dozen senior leaders, most of whom currently or recently served as Federal CIOs in a wide range of federal agencies. The report identifies how these leaders undertook technology innovation initiatives, such as moving agency operations to a cloud environment. They also distilled a series of recommendations for fostering CIO-enabled innovation in other agencies.

This report builds on the Center's continuing focus on bringing innovation to government, including:

- *Creating a Balanced Portfolio of Information Technology Metrics* by Kevin Desouza



Daniel J. Chenok



Timothy Pavlick

- *A Guide for Making Innovation Offices Work* by Rachel Burstein and Alissa Black
- *The Persistence of Innovation in Government: A Guide for Innovative Public Servants* by Sanford Borins

We hope this report serves as an inspiration to CIOs and innovators everywhere in government.



Daniel J. Chenok
Executive Director
IBM Center for The Business of Government
chenokd@us.ibm.com



Timothy Pavlick
Federal Technology Director
IBM US Public Sector
tpavlick@us.ibm.com

Executive Summary

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

This report examines innovation in the federal government in order to understand what is currently working and what is not working in creating and applying innovation. Through our interviews with current and past federal Chief Information Officers (CIOs) and agency staff, we found the following challenges to innovation in the federal government:

- **Challenge One:** Lack of buy-in by key players
- **Challenge Two:** Lack of process discipline
- **Challenge Three:** Inability to determine 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 process, from shipping parts to shipping products. By thinking innovatively about the problem, she was able to dramatically reduce the travel time (and costs) associated with upgrading technology at the stations and deliver dramatically improved computing services.²

In another case, the Federal Communications Commission CIO, Dr. David Bray,³ recently faced the need to replace an aging public-facing consumer help desk and was told by numerous sources that it would cost \$3.2 million and take one to two years to develop. Dissatisfied with this on-premise approach, Bray focused on championing what he calls positive “change agents.” Bray believes that a bottom-up approach better encourages increased innovation at the FCC allowing him to pivot into a role of CIO-as-an-internal-venture-capitalist focused on funding transformational efforts led by multiple actors across the enterprise. His role as champion paid off: the new consumer help desk was achieved using a cloud-based approach at one-sixth the price in less than half the 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>

Based on our interviews, we identified 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 our interviews and our review of successful examples of CIO-enabled innovation in the federal government, we developed five recommendations for federal agencies 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 lifecycle
- **Recommendation Two:** CIOs should assess current and desired levels of innovation maturity
- **Recommendation Three:** CIOs should create a formal process for enabling innovation within the agency
- **Recommendation Four:** Agency heads should foster a culture and space for experimentation
- **Recommendation Five:** CIOs should identify and implement appropriate metrics

By working together, IT-enabled innovation is within reach for all federal agencies and, as a result of innovation, federal agencies will be better able to meet their organizational missions.

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

An Introduction to CIO-Enabled Innovation in Government

Innovation is one of six trends identified by the IBM Center for The Business of Government as drivers for transforming government organizations. In order to drive transformation via innovation, agencies need to:

- 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 of the outcomes to innovation⁶

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

It is helpful to start off with a definition of innovation and, as part of our interviews, we asked our respondents to do so. Gary C. Wang, Deputy Chief Information Officer, Department of the Army, defines innovation within the military context as “the application and generation of ideas to processes, products and services that provide an unfair competitive advantage to the [US] warfighter.” Barry C. West, former CIO at five government agencies, defines innovation as “[breaking] the mold on current trends to become more efficient and effective.” Further, Peace Corps’s Andrews says innovation is “difficult but not altogether impossible” while Amy Northcutt, Chief Information Officer, 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 where IT enables innovation? To find out, we interviewed a cross-section of large and small federal agency information technology leaders, including agency CIOs, and other innovation leaders throughout the federal government. We found that much of the responsibility for innovation is put on the shoulders of these individuals, and 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-enabled innovation in the federal government
- The potential obstacles and measures for CIO-enabled innovation within the federal government

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

6. See IBM Center report entitled *Six Trends Driving Change in Government*, by Dan Chenok, John M. Kamensky, Michael J. Keegan, and Gadi Ben-Yehuda for a full list of these trends and how the public sector can harness them.

Federal Policy and Structures Supporting Innovation

New structures to support innovation have started to sprout across the landscape of the federal government over the past 10 years. While we cannot possibly identify and discuss every office or position implemented during that time, we focus on a few key ones to show the breadth and scope of change currently being experienced 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-based, lean-startup approach to create innovation within the federal government.

Innovation Labs. A new creation in the federal government in the past five years is the innovation office,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 IBM Center, Burstein and Black find a wide range of structures as the concept develops and coalesces 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 tool and innovation 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, industry, or nonprofits.

Presidential Innovation Fellows. A Presidential Innovation Fellows (PIF) program was started in May 2012 as part of the Digital Government Strategy and has recently been made into 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 to work on high-impact projects intended to better serve the American people and improve government functions. 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 IBM Center report entitled *A Guide for Making Innovation Offices Work*.

- MyGov 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 Eighteenth and F Streets) was created in March 2014 as part of the U.S. General Services Administration (GSA). Its establishment was a direct reaction to the problems with the launch of HealthCare.gov and was aimed at reforming the way the federal government executes IT-enabled innovation. 18F houses the PIFs and was launched on a technology start-up model to provide consultancy within the government in order to rapidly develop, deploy, and integrate tools and services for the betterment of the public. 18F is focused 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 that people and businesses have with their government.

One example of a USDS project is a recent effort to improve immigration processing. As part of its analysis, it found that the voluminous paper files required for permanent resident status in the U.S. are transferred six times during the course of the approval process, resulting in an unwieldy and error-prone strategy. By examining the process, USDS made numerous recommendations on speeding and simplifying 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 making government more transparent, participatory, and collaborative through the increase in accessibility and availability of federal government data. *A Presidential Memorandum on Transparency and Open Government*, released in January 2009, resulted in the establishment of the Data.gov website by the U.S. CIO in May 2009 with a goal of making the data produced by the executive branch of the federal government accessible.

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 sites, 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

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

included the U.S. CIO and CTO, highlighting the need for technical leadership in policy implementation.

Trends in CIO-Enabled Innovation in Government

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

Open innovation. Open innovation refers to a belief and approach where boundaries between the organization and its environment become less impermeable, suggesting that organizations should look both internally and externally for ideas; cannot rely entirely on their own knowledge, experience, and research; and should combine internal and external mechanisms to produce their products and deliver their services.

Crowdsourcing. Crowdsourcing—a contraction of crowd and outsourcing—is a method of soliciting individual contributions from very large, often online, external communities as a supplement, complement or replacement for a limited, direct internal workforce in order to meet production, service or innovation needs of the organization.

Ideation. One innovation that emerged in the past decade is ideation,¹² a word formed from the contraction of idea generation. Ideation is the process for finding solutions to agency issues using crowdsourcing techniques and technologies to solicit new ideas both internal and external to the agency.

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

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

Lee concludes that internal ideation is beneficial for:

- Leveraging creating thinking that already exists in agencies
- Further engaging the federal public service in solving difficult, enduring problems
- Building a sense of community and engagement around problems and their solutions across large, complex, and dispersed agencies
- Growing the 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. *Crowdsourcing: 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 range from using the ideation program as a vehicle to reinvent the agency, to measuring the impact of programs, to learning from other agencies and industries.

Challenges. A related mechanism for stimulating innovation is a prize competition, which the IBM Center report, *Managing Innovation Prizes in Government* by Dr. Luciano Kay examines in detail. Kay studies three prize competitions as case studies—the Ansari X Prize, the Northrop Grumman Lunar Lander Challenge (NGLLC), and the Grand and Urban Challenges of the Defense Advanced Research Projects Agency (DARPA)—with the latter two being federally funded. Each of these programs sparked the imagination of both government and industry, with prize values ultimately being dwarfed by the investment of organizations seeking the prize. Prize programs can be seen as useful complements to more traditional development programs, with particular applicability to problems that imply high-risk R&D requires unconventional approaches, or can they draw on external resources.

Competitions can be highly valuable for a number of pragmatic and practical reasons. First, they are a hedge against risk because only the winner is rewarded. Second, because of the first-across-the-finish-line approach, they have the potential to greatly leverage the prize value, should competitors need to invest to innovate. And finally, with the extensive use of the Internet and other communications technologies, competitions can raise public awareness, spur crowdsourcing 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 could advance agencies' missions. The website Challenge.gov was launched in September 2010 from this legislation and exemplifies how citizens can be engaged and empowered to help the government address problems in innovative ways.

Challenges often use crowdsourcing to solicit solutions for specific problems, connecting citizen innovators with government implementers. As a simple yet effective platform, Challenge.gov has launched over 400 competitions, awarded over \$120 million in prizes, and involved more than 150,000 participants supporting over 75 federal agencies in its first five years. A detailed analysis of Challenge.gov, its initial successes, and its areas for improvement can be found in the IBM Center report, *Challenge.gov: Using Competitions and Awards to Spur Innovation*, by Kevin C. Desouza.

Recent IBM Center Reports on Innovation

Using Innovation and Technology to Improve City Services, by Sherri R. Greenberg

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

A Guide for Making Innovation Offices Work, by Rachel Burstein and Alissa Black

The Persistence of Innovation in Government: A Guide for Innovative Public Servants, by Sandford Borins

Engaging Citizens in Co-Creation in Public Services, by Satish Nambisan and Priya Nambisan

Using Crowdsourcing in Government, by Daren C. Brabham

Challenge.gov: Using Competitions and Awards to Spur Innovation, by Kevin C. Desouza

Managing Innovation Prizes in Government, by Luciano Kay

The Innovation Lifecycle

A model for the innovation lifecycle includes the following stages:¹³

- **Stage One:** Idea Generation and Mobilization—Focusing on the initial idea generation and its surfacing through the organization
- **Stage Two:** Advocacy and Screening—Championing the innovation and evaluating 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 solution for internal or external stakeholders
- **Stage Five:** Diffusion and Implementation—Spreading the word about the innovation and helping stakeholders begin to use it

Underlying this model are five central beliefs:

- First, most organizations are good at *generating* innovative ideas, but are weak at bringing an idea to fruition. Therefore, potential innovators become frustrated with a work environment that encourages employees to be inventive, but fails to support the innovation.
- Second, rather than springing fully formed from a dedicated innovation lab or office, most innovations are “ground up” from the employees in the field, but they require support from all parts of the organization to become implemented. While we are not dismissing the discoveries that originate in innovation offices, most 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 challenging (and unproductive) to “hold” ideas until a certain time. Thus, the process for innovation needs to operate continuously.
- Fourth, very rarely does an innovation emerge fully formed. Most implementations arrive in a raw state and need to be processed and refined before they can be suitably evaluated and implemented. The goal of the innovation lifecycle is to provide that processing.
- Fifth, not all innovations are created equally. They can be short-term operational innovations, tactical renewals, or strategic overhauls. The size of the innovation and its potential impact drive a much shorter (or longer) refinement process.

In many ways, the innovation process can be thought of as an hourglass that starts broadly (lots of people generating many ideas), narrows down ideas and those involved (through advocacy, screening, and experimentation), and then widens to involve more people in the

13. These stages and their description 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.

organization. Thus, many people are involved in creating and using innovation (top and bottom of the hourglass) but only a relatively small number are involved in evaluating the suitability of the innovation.

Each stage is discussed below.

Stage One: Idea Generation and Mobilization

In this stage, a substantial number of people are involved in creating innovative ideas that are collected and refined before being narrowed down to the best ideas. Rather than expending resources equally on all ideas, this stage is designed to capture all of the ideas and then, based on some initial refinement, decide which ideas are most workable and appropriate. This can be daunting; many innovative ideas are “nice to have,” but fail to rise to the level of improving the organization.

In this stage, it is essential that a potential user of the innovation is identified because the value of the innovation needs to be based on the value to its user. We note that this potential innovation user can be anyone, including the innovator, the agency, other agencies, citizens, etc. It is not uncommon that these ideas have several users in mind.

For example, Darren B. Ash, Chief Information Officer at the U.S. Nuclear Regulatory Commission (NRC), describes a proposed innovation that enables onsite field personnel to capture and analyze data faster. While this innovation was aimed at the 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—that is important, and this fact surfaced during the mobilization phase. This highlights the importance of carefully examining all of the potential users of an innovation.

Stage Two: Advocacy and Screening

In this stage, the idea moves from the innovator’s hands into the organization’s large ecosystem. Others get involved in screening the value of the idea and, if the idea has merit, advocating for it. NRC’s Ash describes this as “ensuring that the juice was worth the squeeze,” meaning that the final implemented innovation needs to be worth the effort to bring it to fruition.

It is easy to get trapped in this stage, or as 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. This screening is used to develop a preliminary business case for the idea. If the idea has a positive business case, the idea 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 the innovation has a positive “first cut” business case, it moves into this stage, where the innovation is more closely examined and refined. It is at this point that the organization becomes fully involved with the innovation and improves it.

It is also at this point that the idea moves out of the employee’s ownership and into the organization’s ownership. In this stage, the organization puts its full might behind the idea to determine its appropriateness and resilience to a variety of business conditions. Clearly, a more strategic innovation will receive much greater scrutiny than an operational one.

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 Peace Corps "... [does 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 roadmap 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, this 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 resource 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. Doreen Andrews joined the agency as its new CIO. In this role, Andrews was charged, with her 90-plus member team, with turning the office around to dramatically improve the agency's information technology solutions at headquarters, regional offices, and in over 65 countries worldwide.

One of the major innovative 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, but most importantly, it reduced deployment time from three years to 18 months to get all international stations on the same new 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—i.e., 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, technology-related outages have decreased, and automation technologies have eliminated much of the tedious work.

The field staff now has 24-hour support, thanks to a small group of six regional IT specialists who support stations close to and far from headquarters. They have been empowered to train their own station staff, share field-based solutions among themselves instead of just with HQ engineers, and ensure the balance between unique station needs (e.g., lack of consistent Internet connectivity) and global standards (e.g., standard platform, storage, and software development platforms).

For example, NRC's Ash describes the existing reach-back capability for field inspectors as being limited to calendar information and some limited content and e-mail. Employees noted that they needed to be able to manipulate documents and add multimedia content directly and immediately on-site with a portable device, rather than take field notes, which would be transcribed when back at the office or hotel. Ash sponsored a pilot implementation of 50 field users with an array of new capabilities for a three-month study prior to refining the final deployable suite. This enabled the organization to "shake out" the idea before implementing it throughout the organization, thus likely maximizing the chance for a successful deployment.

Stage Four: Planning

In this stage, 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 designed to lead to its eventual implementation. It is critical that the unintended consequences of the idea are considered here.

For example, Peace Corps's Andrews describes previous development and deployment of a field station communications/IT suite that proved costly. Mini-data centers were engineered for each station by region, with installation and training conducted onsite by fly-in headquarters personnel. There was tremendous regional customization as each regional deployment took over 12 months, and the engineering team upgraded the technology before each regional implementation. The result was a unique architecture 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. While the original approach produced a more highly customized platform for a region, it slowed the agency's ability to engineer the solutions for each region and deploy these platforms. 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.

Because Andrews dramatically changed the agency's refresh approach, the final implementation across the three regions took half the time (18 months instead of 36 months), empowered field staff to do their own training and maintenance with testing manuals, and took advantage of new technologies. The big lesson learned was that her engineering team, like many teams, had become stuck in their comfort zones from the past, and she had to push them toward innovation with a new vision that was feasible and affordable.

Various aspects for consideration in the planning stage include the timing for its implementation, the people performing the implementation, the contracting approach (if any), ownership of the innovation, etc. If necessary, any required funding is also identified and allocated.

Stage Five: Diffusion and Implementation

In this stage, the idea is implemented and then diffused throughout the organization and its potential users. This stage is the most challenging because it is only now that reluctant adopters are pushed to adopt. To address this, the organization needs a strong change management plan to accompany the innovation. Additionally, if those outside the organization are users of the innovation, a publicity push should be central.

As an example, we note that many agencies are now on the path to move to 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 vs. attempting on-premise, system-specific upgrades. Such a shift would also require moving away from the 1990s' app-centric world to embrace a more modern, data-centric, cloud-computing world. Bray knew that such a shift would be a significant culture change at the FCC, requiring a phased approach. It would include quick wins initially to minimize resistance, then a dramatic physical move of all remaining systems to either the cloud or a commercial service provider to achieve budgetary benefits.

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

When first stepping into his role, FCC CIO Dr. David Bray knew he faced a challenge. There had been nine CIOs in eight years prior to his arrival, and previous efforts at innovation had not been successful. As a result, many of the FCC IT staff feared failure. While the senior leadership at the FCC was fully supportive of innovation, the staff was reluctant.

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

FCC CIO Bray and his team researched what other agencies had done and discovered that, according to the private sector, it would cost \$3.2 million and take almost two years to install a new in-house system recommended as a gold-standard by other agencies. By going instead to a “Software as a Service” (SaaS), Bray and his team of “change agents” got the system done at one-sixth the price (\$450,000), in less than half the time. This system has the additional benefit of being hosted in the cloud versus on-site. In this way, the FCC leverages the resources and security that were already part of the vendor’s services without having to invent them within the agency.

After achieving the “quick win” with the new consumer help desk, the FCC achieved similar wins by moving other systems to the cloud in similarly accelerated time frames—usually at one-sixth or one-fifth the price of on-premise implementations and in half the time. This led to a bold effort in September where 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 achieve maintenance costs budgetary benefits. Specifically, the FCC’s operations and maintenance (O&M) expenditures dropped from being 85 percent of its budget in 2013 to less than 50 percent—compared to an average O&M cost of more than 80 percent, as recently reported by the U.S. GAO and Federal CIO.

Even with this leadership, according to Bray, there were still those within the vendor community who wanted to follow the traditional software development and an on-premise procurement approach for IT systems.

As such, Bray believes any senior executive needs to be both “a digital diplomat and 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 encouraging bottom-up “change agents” able 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 organization culture to encourage and support creative problem solvers. They would be empowered to take action to resolve long-standing issues, and they would be held accountable to address issues within their domain, with the backing and willingness of the CIO to “take flak” if friction occurs.

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. Bray 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 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-premises system. The new system also proved easier to use by both the public and FCC, reducing the time required to investigate issues of public concern.

As Bray notes, it is easy to focus on the infrastructure costs and ignore the human time and costs with legacy systems. These include costs in terms of time required to use a system by the public and practitioners, 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 an iceberg weighing down an existing organization in ways beyond just ongoing system maintenance costs. To overcome this, Bray encourages an entrepreneurial “startup mentality” in the organization focused on escaping such 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 and propose solutions to problems, 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 innovation: 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-Enabled Innovation: Challenges from the Field

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

Challenge One: Lack of 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 innovation. Fueled by stories of companies started by founders in garages or dorm rooms, government and industry often succumb to the romantic myth that true innovation is a solitary endeavor.

Perhaps as a result of the “hero” myth, some agencies have adopted a skunkworks 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 sometimes missed 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 its necessary oversight and support structures. In these agencies, a few undeniably talented people are isolated and directed to be innovative. While some good ideas have emerged, these ideas have generally wilted in isolation without proper support and wisdom of other key players in the agency. Further, these ideas were often out of sync with the realities of current operations, technology, or the budget. As such, we caution that while innovation offices may be successful, they need to be thoughtfully addressed and not exclude innovation by others within the organization.

As Renee Wynn, CIO at two federal agencies, says, “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 engine to idea generation and mobilization. As a result, while we see the value in innovation offices in 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 the key players are involved—early and often—in the innovation process, as innovation is a leadership responsibility. As such, this remains a challenge through the entire innovation process and in every stage of the innovation model.

Challenge Two: Lack of Process Discipline

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. Rather, often the person who generates the idea is unaware of a process to enact the innovation, and either tries to create a process or simply gives up trying to implement it. 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, but it allows IT-based innovation to flourish in bureaus and field offices.

As a result of the lack of process, potentially workable ideas are routinely developed and discarded before they can be officially screened through a rigorous process. Numerous interviewees told us stories of great innovations that were created but never implemented due to a lack of awareness of the process or the fear of failure. West says, “Governments are not always good about failure; people get punished for it.” West pushes for more agile methods that allowed innovators to “fail fast” and learn from experience, putting in place 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 an innovation that languishes in obscurity until the leadership finds out about it and brings it to fruition. The function of championing the idea is often performed well once identified, but it is probable that the innovation may 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 it 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. But Ash, noting that this type of extraordinary intervention should not be necessary, works to create a more open and collaborative environment in which a new culture of change allows for innovation to rise through the organization to the advocating and screening stage.

In this case, as with numerous other stories we heard, innovative ideas are only implemented if the CIO becomes aware of the innovation and personally spearheads its implementation.

Challenge Three: Inability to Determine 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 and 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.

NSF’s Northcutt describes her process for calculating the business case for innovation project screening, saying, “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. Their responses were all similar: it is very hard and we don’t have it worked out yet. What was required was an agency-specific method, as value is often context-specific.

In both the experimentation and planning stages, the challenge is to accurately identify the quantifiable benefits (and risks) associated with the innovation, and because of this, innovators have a great deal of difficulty convincing senior management about 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 innovation, 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 are a greater challenge. Most agencies express frustration in their ability to quickly attract and retain the skilled external consultants needed to implement the innovation, particularly if it is a tactical or strategic, rather than a more straightforward, operational innovation.

They are equally frustrated with the antiquated and often byzantine acquisition rules and procedures. Once a potential innovative problem is selected, acquisition becomes a significant challenge, whether experimenting with the initial concept, scaling it up for commercialization, or extending it for full-scale implementation across the government.

Peace Corps’ Andrews says it is important to bring in external parties to assist with innovation. She gives an example of hiring software development personnel trained in agile methodologies, but notes 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 to produce inches-thick procurement documentation for a \$50,000 contract.

NSF’s Northcutt notes that acquisition tends to be very conservative; thus, agency leadership needs to partner with acquisition and work within its regulations and strictures. Northcutt stresses that it 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.

Because innovations spring up as new ideas, 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 suitable contractor. This process can take many months, and as a result, potentially innovative ideas lose momentum and are abandoned due to the procurement issues.

Challenge Five: Few Metrics Are Kept

Finally, very few metrics appear to be kept on innovation, and this stymies the ability to understand either the effectiveness of the innovation process at each agency or the issues associated with it. This is true at every stage of the model. As a result, much of the work on innovation is based on “best guesses” from those involved in the process. One CIO notes that no innovation metrics of any sort are used or tracked 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 lifecycle 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 a trade-off as every innovation that introduces a system has to have an offset or a specific budget line to account for it, requiring excellent estimation and measurement skills. This is even more critical in a time when the technical debt associated with legacy systems is growing rapidly and must be addressed with innovative solutions before it becomes insurmountable.¹⁵

Ideally, detailed metrics should be kept on each step. In fact, Army's Wang does just this. His metrics tracked inputs, processes, and outputs, and were 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 see this resource-capability-leadership approach applied to the five stages of innovation model with great success. This is an excellent use of metrics and similar ones should be adopted for all organizations within every stage of the innovation lifecycle. However, this was an outlier in our interviews and most agencies do not track any metrics associated with innovation.

14. Further discussion of innovation metrics can be found in the IBM 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/>.

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

Based on our interviews, five key findings emerged:

- **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, 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 at all levels within the organization and by all key stakeholders. The emphasis on getting innovation right is prominent in strategic plans and in our conversations. Renee Wynn notes the important reflective nature 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; therefore an agency needs “bold leadership” to insist on a good business case for innovation, and to have it done in the correct way. 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 innovation. Our respondents recognize the need to be innovative, and this facilitates improvement.

Finding Two: Examples of Innovation and Innovative Practices Abound

Rather than finding 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 existed 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, but rather by 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 notes a requirement coming 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 how cloud computing could improve their security posture. A third notes the decreased capital and personnel investment in the cloud, making it scalable through operating funds. Regardless of the impetus, agencies are converging on a set of technologies and approaches to innovation in this area.

Innovative practices generally span organizational levels, as they require close coordination among organizations within a federal department or agency. Department of the Interior's Burns notes that her strategy for innovation is all about building relationships with other executives, which 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 the 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 the agency. This suggests that there is nothing systemic in the federal government to obviate the ability to be innovative, and it is a far simpler problem to assemble best practices as opposed to creating them.

Finding Three: Challenges Are Not Insurmountable

Our interviewees commented that twin killers of innovation are often a lack of interest and/or a lack of funding. Based on our interviews, we did find these "killers" present in the agencies. CIOs, staff, and external stakeholders are all interested in seeing innovation flourish. Additionally, while funding is always tight, no agency thinks funding is a key limitation to successful innovation. In fact, most agencies point out that successful innovation often offers a net cost savings and funding is not an obstacle.

As an example of surmounting challenges, some issues in procurement have started to be addressed. The Federal Information Technology Acquisition Reform Act (FITARA) was specifically designed to drive efficiencies and cost savings in acquisition, and to trim waste and loss seen in failed IT programs. Mechanisms such as establishing the Federal Commodity IT Center and designating Assisted Acquisition Centers of Excellence will go a long way toward improving coordination and designing low-cost acquisition practices. As a focal point for commodity IT, they are a method for aggregating federal government demand in order to recognize 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 allows agencies to accelerate their delivery of new services by establishing a streamlined and common contracting vehicle to bring these services to bear on their agency-specific requirements.

CIOs are uniformly hopeful and positive regarding their agencies' ability to increase opportunities for innovation, and they are consistent in their desire and effort to search them out. For example, Army's 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 could also influence outcomes. As one respondent notes, “Innovation can come from the top, bottom, and side, but open innovation within the organization is best.”

Part of the ecosystem is the collection of bureaus, regions, and field offices within each agency. In their report to the IBM Center for The Business of Government, *Making Open Innovation Ecosystems Work: Case Studies in Healthcare*, Donald Wynn, Renee Pratt, and Randy Bradley define ecosystem as the “set of individuals and organizations (i.e., members) operating within a given market space in order to provide a complete value proposition to the end customers, who are also part of the ecosystem.”¹⁶ In our report, we are focusing on government organizations as part of the technology innovation ecosystem.

For example, former CIO West notes a particular field office was very good at innovation and created its systems to “fly under the radar of HQ.” West recognized the value of these innovations, but needed to surface them and then adopt them agency-wide. FCC CIO Bray says a diversity of ideas has been shown to lead to better performance outcomes, including long-serving employees within an agency and those who just arrived; this can only occur in a participatory environment. A key component of successful innovation is therefore to involve as many kinds of staff members—both old and new—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 described getting good ideas from the CIO Council. 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 the 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 and create the change opportunity. As Dr. Tyrone Grandison, Deputy Chief Data Officer at the Department of Commerce and former Presidential Innovation Fellow, notes, the benefit to the PIF program was 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 using 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.

Like 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.

16. Donald W. Wynn, Renee M. E. Pratt, Randy V. Bradley, *Making Open Innovation Ecosystems Work: Case Studies in Healthcare*, Washington, DC: IBM Center for The Business of Government, 2015.

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

Finding Five: Leadership Can Foster Innovation-Oriented Culture

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

Many of the issues have to do with acceptance of risk and the possibility of failure. FCC CIO Bray notes that agencies have talented people who are willing to learn, but the people have not been heard and enabled. He posits that within public service organizations, several career employees have not been encouraged to take on high-risk/high-reward activities and can even be penalized for going outside of the boundaries. Bray himself was willing to lead a transformation at the FCC because he perceived the cultural situation 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 would lead to a great increase in innovation. He felt he needed to change the narrative to encourage risk-taking in pursuit of innovation.

The culture 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 culture within the IT community. Army’s Wang notes that some people are naturally innovative, but innovation can be taught to anyone. However, more training opportunities are needed for learning innovation in public service. FCC CIO Bray notes 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 an organization. They are given autonomy to identify and propose solutions to problems, measurable progress on their self-led efforts, and meaningful missions that carry with them a strong sense of purpose.

Recommendations for Fostering CIO-Enabled Innovation

Based on our interviews, we set forth five recommendations for organizations to implement, or improve their implementation of, innovation. The implementation 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 innovation process).¹⁸

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

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

From our research, it appears that many innovations fail because the innovator is left to implement the innovation by him/herself due to the lack of involvement of key individuals. The myth of the lone innovator is well-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 is 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 lifecycle. The agency director is most responsible for charting the course for the organization and is in the best position to screen, select, and promote the best innovations supporting the organizational mission.

However, it is equally clear that the agency director has not cornered the market on good ideas and therefore needs to empower employees with the responsibility to generate and elevate innovation to management. It is only by tapping the vast experience of those in public service that the requisite large number of potential innovations can be created, then ensuring 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."

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

One respondent stresses why innovation needs to start at the agency director level by saying “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. Once this has been done, the remainder of the recommendations can be carried out.

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

Before implementing any major innovation 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 where 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 the innovation implementation or its effect. 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, these local instances have very little in common with the instances at other points in the organization. That is, if innovation occurs within one part of the organization, the innovation process 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. These agencies 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, and 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 appropriate for each part of the organization.
- **Optimized:** In this stage, the agency adopts a continuous improvement approach to innovation to ensure that the process is continually examined and improved. Processes and the metrics that capture their effectiveness are revisited and considered against changing environmental conditions and agency goals.

Using a common scale for maturity assessment (current and desired) also facilitates benchmarking among agencies. By developing and using a common maturity 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 will then evolve into a more practical exercise rather than a purely academic one, and it should also set the stage to create the formal process for innovation (Recommendation 3). This allows the agencies to share benchmarking data and exchange knowledge around innovation processes and targets. It also clarifies the amount that the organization is willing to spend to pursue innovation.

Recommendation Three: CIOs Should Create a Formal Process for Enabling 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 this clear. Operational innovations, which are likely to comprise 90 percent of the innovations, 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 a bureaucracy rather than innovation.

We caution that while similarities may exist between how innovation occurs in 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 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 cases. Over time, we expect that each agency will refine its processes and share its best practices, allowing commonalities to emerge. We suggest that the forums for sharing best practices are the respective CIO Councils.

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

Recommendation Four: Agency Heads Should Foster a Culture and Space for 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 the field/bureau staff, it is important that the agency director creates a culture of innovation. While Google's "20 percent time" rule¹⁹ is unlikely to work within the confines of government, there is no reason for the agency director not to encourage innovation using other means, such as employee recognition programs. By allowing (and encouraging) agency personnel to be innovative, innovation is likely to flourish.

The agency director also needs to consider physical space for innovation. The ability to build prototypes and proofs of concept requires offline facilities to test prior to pilot testing. This 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 the 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 saw one organization that had 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

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

metrics are captured and used. In his recent IBM report, Desouza discusses how to create a balanced portfolio of metrics and provides excellent insight on how to design, implement, and evaluate a metrics program.

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

- First, the goals of the agency need to be clear before starting to develop metrics, 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 the metrics and their benchmarks to ensure that the metrics can be captured and are insightful. In general, it is helpful to have fewer and less complex metrics. This also helps to drive an understanding of how innovative the agency needs to be and how much the agency is willing to spend on innovation.
- Second, as the metrics plan is implemented, the CIO needs to communicate with the stakeholders on the achievement of key metrics, as well as the failure to achieve them. This is important to ensure that the metrics are not being gamed and are being thoughtfully applied to make changes in the process.
- Third, the CIO needs to periodically revise the metrics in order to ensure that they are not simply being kept for the sake of having metrics. At a regular interval (we suggest quarterly), the CIO should examine metrics for effectiveness and, as appropriate, revise them..

Illustrative Metrics to Assess IT Innovation

Personnel	<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
Projects	<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 changes • Average scope changes per project
Budget	<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
Stakeholders	<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

Source: Kevin C. Desouza, *Creating a Balanced Portfolio of Information Technology Metrics* (IBM Center for The Business of Government) 2015, p. 30.

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

About the Authors

Dr. Gregory S. Dawson is a Senior Faculty Associate at the Center for Organization Research and Design (CORD) within the College of Public Programs at Arizona State University and is also an Assistant Professor in the W. P. Carey School of Business. Dr. Dawson was awarded his PhD in Information Systems from the Terry College of Business at the University of Georgia.

Prior to becoming an academic, Dr. Dawson was a Partner in the Government Consulting Practice at PricewaterhouseCoopers, joining PwC (formerly Coopers & Lybrand) in the Washington, D.C., office and later relocating to Sacramento, California. Dr. Dawson was a leader in the field of public sector outsourcing as well as information systems implementation. He has worked extensively with the federal government (including Central Intelligence Agency, Department of Defense (Army, Navy, Air Force and Marines), the Federal Deposit Insurance Corporation (FDIC), and the Bureau of the Census, among others) and with a variety of state governments (including Virginia, North Carolina, Pennsylvania, New York, and California). After leaving PwC, Dr. Dawson was a Director at Gartner, working in the state and local government practice.

Dr. Dawson is also the President of the Association for Information Systems Special Interest Group on IS Leadership and co-leads a track on IS leadership at a major IS conference. His research is primarily focused on information systems leadership and innovation in the public sector. His work has been published in a variety of top academic and practitioner journals. His research has been published in *Journal of the Association for Information Systems*, *Decision Support Systems*, *Organization Science*, *Journal of Management Information Systems*, *ACM Transactions on Management Information Systems*, *Communications of the Association for Information Systems*, *InformationWeek* and numerous Brookings Institution reports.



Dr. James S. Denford is an Associate Professor and Head of the Management & Economics Department at the Royal Military College of Canada (RMC). He holds a PhD in Management Information Systems from Queen's University and an MBA and Bachelor of Engineering Management from RMC. Before making the transition to academics, he spent 24 years as an Army Officer in the Royal Canadian Corps of Signals in diverse roles including tactical communications and information systems deployment, IT project management, network management and operations, and IT training. He also led two defense research labs, first as Director of the Army Experimentation Centre and then as the Director of the Electro-Magnetic Battlespace Lab. In these roles, Dr. Denford employed advanced simulation systems to create IT-enabled innovation in both Army and Joint manoeuvre and network operations within complex security environments.



Dr. Denford is also the Secretary of the Association of Information Systems Special Interest Group on IS Leadership and co-leads a track on IS leadership at a major IS conference. In addition to his current Department Head role at RMC, he previously served as Director of Research Administration overseeing the financial management of research and innovation for the university. His research is focused on strategic alignment, knowledge strategy, and IT governance. His research has appeared in the *Journal of Knowledge Management*, *Knowledge Management Research & Practice*, *Journal of Information Systems*, various knowledge management and information systems books, and public forums including *InformationWeek* and the Brookings Institution.

Key Contact Information

To contact the authors:

Gregory S. Dawson

Senior Faculty Associate, Center for Organization Research and Design (CORD)
Assistant Professor, W. P. Carey School of Business
Arizona State University
300 E. Lemon St.
Tempe, AZ 85287
(602) 908-1915
e-mail: GregorySDawson@gmail.com

James S. Denford

Associate Professor and Head
Management & Economics Department
Royal Military College of Canada
PO Box 17000 Stn Forces
Kingston, ON, Canada K7K 7B4
(613) 541-6000 x 6970
e-mail: jim.denford@rmc.ca



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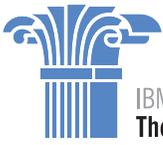
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For more information:

Daniel J. Chenok

Executive Director

IBM Center for The Business of Government

600 14th Street NW

Second Floor

Washington, DC 20005

202-551-9342

website: www.businessofgovernment.org

e-mail: businessofgovernment@us.ibm.com

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