



# Creating a Balanced Portfolio of Information Technology Metrics



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## Foreword

On behalf of the IBM Center for The Business of Government, we are pleased to present this report, *Creating a Balanced Portfolio of Information Technology Metrics*, by Kevin C. Desouza, Arizona State University.

Information technology (IT) has made possible the availability of real-time data and the tools to display that data, such as dashboards, scorecards, and heat maps. This has boosted the use of data and evidence by government decision makers in meeting their agency and program missions. But what about the use of performance metrics by chief information officers (CIOs) themselves?

Typically, CIOs have a good inventory of metrics regarding the performance of their technical infrastructure, such as server downtime. Metrics on nontechnical elements, however—such as innovation capacity of the IT department and the health of the overall IT organization—are in earlier stages of development. These metrics are critical for CIOs to have in order to manage their IT departments, build a broader base of support for IT investments, and convey the strategic value of IT assets for attaining agency-wide objectives.

Professor Desouza argues that a balanced portfolio of metrics is needed for project management, operations management, and innovation in order to effectively deliver on agency mission objectives. The author interviewed over two dozen federal, state, and local government CIOs to find out the types of metrics they found most useful, and the challenges they face in leveraging metrics effectively. Desouza synthesizes findings and makes them readily accessible to nontechnical readers, and makes recommendations for designing, implementing, and evaluating IT metrics programs.

Technology leaders at the federal level are creating processes and systems to ensure that IT metrics are integrated into broader agency decision-making processes. Since 2009, for example,



Daniel J. Chenok



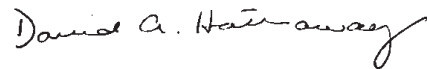
David A. Hathaway

federal agencies have followed guidance from the Office of Management and Budget in holding TechStat meetings on a regular basis to assess the progress of new IT investment projects, and have also developed IT Dashboards and PortfolioStat. IT metrics that are tied to agency mission performance can clearly demonstrate the benefits of sound IT investments. Based on his research, Desouza concludes that a balanced portfolio of metrics can help agency CIOs to capture the progress and value of IT investments to the overall organization.

We hope the framework and insights offered by Desouza are useful to CIOs, IT managers, and agency executives. As Desouza notes, government IT leaders need now to be part of “a new era of government performance management that is data-driven, constantly evolving, and optimized.”



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# Executive Summary

Given the growing dependence on information technology (IT) for service delivery and the accomplishment of mission objectives and the trend of increasing spending on IT, it is important that we have tools and techniques in place to develop a balanced portfolio of measures of IT performance which include IT project management, IT operations management, and IT innovation.

This report investigated the state of the use of IT metrics in the public sector. The project reviewed literature across diverse fields such as management sciences, information systems, public administration and management, and operations management to examine the state-of-the-art approaches to the use of metrics for IT in the public sector. The project analyzed strategic plans from federal and state government IT offices to understand how metrics were captured in these formal plans.

Twenty-seven chief information officers (CIOs) and/or IT directors were interviewed on their use of metrics to manage IT departments, personnel, infrastructure, projects, and innovation. The interviews identified four challenges:

- **Challenge One:** Many IT metrics will depend on other organizational units meeting their performance targets
- **Challenge Two:** IT metrics require a focus on long-term planning
- **Challenge Three:** CIOs will need to coordinate efforts to integrate metrics and develop standards for comparison
- **Challenge Four:** IT departments must have the ability to collect real-time data on IT operations

The report found that CIOs recognize and understand the value of metrics. CIOs have created programs to support the collection, analysis, and communication of data on IT programs, but are challenged to find the time and resources to implement comprehensive performance management programs within their departments. This report presents 14 recommendations for designing, implementing, and evaluating IT metrics:

## Designing an IT Metrics Program

- **Recommendation 1:** Set clear goals before selecting metrics
- **Recommendation 2:** Develop a strategic IT plan linked to agency strategic goals
- **Recommendation 3:** Engage internal and external stakeholders in the development of metrics
- **Recommendation 4:** Collect baseline data on performance
- **Recommendation 5:** Avoid “watermelon” metrics

- **Recommendation 6:** Select fewer and less-complex metrics
- **Recommendation 7:** Design and build dashboards that capture metrics
- **Recommendation 8:** Do not focus exclusively on IT infrastructure Metrics

#### **Implementing an IT Metrics Program**

- **Recommendation 9:** Communicate regularly and often with key stakeholders about metrics
- **Recommendation 10:** Keep metrics updated
- **Recommendation 11:** Use metrics to set targets
- **Recommendation 12:** Keep an eye out for people gaming the metrics

#### **Evaluating an IT Metrics Program**

- **Recommendation 13:** Revise metrics periodically
- **Recommendation 14:** Seek continued renewal and improvement



# An Introduction to Information Technology (IT) Metrics in Government

## The Need for Metrics

Information technologies (ITs) are critical assets in all aspects of the public sector. The criticality of designing, implementing, and maintaining IT assets in an effective and efficient manner cannot be underestimated. Over the last few years, spending on IT has increased across all three levels of government (federal, state, and local), and most observers expect this trend to continue.

Given this growth in spending and the critical connection of IT to the operations and success of public agencies, we hear a limited number of success stories on how IT has helped transform agencies, deliver service more optimally, save taxpayer resources, and even lead innovation efforts to address vexing social challenges. We are more likely to hear about IT projects that have “gone rogue” and failed to deliver on their promises.

One possible cause for these problematic IT projects is that the chief information officer (CIO) community has not done enough to invest in the creation of metrics that capture the performance of IT assets and their contribution to organizational performance. Building performance management processes and capabilities requires CIOs to invest time and effort to capture, validate, analyze, and share data on metrics. In the absence of credible information on IT performance, anecdotal evidence about IT failures is likely to dominate the discussion of IT performance in the public sector. With the availability of IT performance metrics, CIOs can both proactively manage performance and demonstrate mission results.

Metrics identify organizational priorities and measure the performance of those priorities. Metrics should track performance and guide operational and strategic decisions. The Government Accountability Office (GAO) and the Office of Management and Budget (OMB) have extolled the need for quality IT metrics in government to measure and assess the effectiveness and viability of IT projects.

Despite repeated calls, much work is needed when it comes to infusing metrics into the management of IT departments, projects, and processes. In a 2013 Congressional hearing on reducing duplication and improving IT outcomes, Senator Tom Coburn acknowledged that, in government IT “...we do not have real transparency and metrics on what we are doing.”<sup>1</sup> At the same hearing, Steven VanRoekel—then federal Chief Information Officer and Administrator for E-Government and Information Technology—acknowledged that “sound management is rooted in evidence, metrics, data, and incentives.”

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1. Senate Hearing 113-97 on reducing duplication and improving outcomes in federal information technology. (June 2013). U.S. Congress. Committee on Homeland Security and Governmental Affairs, Washington, D.C. Retrieved April 29, 2015, from [www.gpo.gov/fdsys/pkg/CHRG-113shrg82569/html/CHRG-113shrg82569.htm](http://www.gpo.gov/fdsys/pkg/CHRG-113shrg82569/html/CHRG-113shrg82569.htm).

## The Challenge

In light of very public IT failures at each level of government, the time now appears ripe for further improvement in the management of IT projects with the development of IT metrics. There are efforts under way to modernize policies and procedures when it comes to IT management and the role of the CIO. The challenge is that IT projects are highly complex. Government now is attempting to better manage that complexity. Part of the response to this complexity has been the increased emphasis on developing metrics to measure current IT performance. As government deals with the challenge of IT and organizational complexity, its response has been to enact stronger performance management tools such as metrics. Metrics should be used to measure current performance, as well as to signal opportunities for improvement.

It is evident from examples from across the country that public agencies' use of metrics for IT projects is largely inconsistent. Attempts to standardize metrics have been made, but bureaucratic resistance often prevents metrics from being implemented in a systematic fashion across organizations. Despite repeated mandates for a stronger focus on metrics, many public agencies are still struggling with designing, implementing, and using high-quality metrics.

In a February 2015 audit of 20 Department of Defense (DoD) major automated information systems—which include communications, business, command, and control systems—GAO found that 12 out of 20 programs did not have cost and performance metrics in place within the first two years of the programs. GAO found that it took the DoD, on average, five years and two months, and \$452 million, to establish baselines for life cycle cost, scheduling, and performance targets.<sup>2</sup>

In spite of the challenges, complexity, and inconsistency, a focus on metrics is important. Metrics are needed to increase transparency of operations, track progress, spur innovation, and understand places for improvement. Nicholas Carr wrote in his famous and highly debated piece, “IT Doesn’t Matter,” in the *Harvard Business Review* that IT has become so commoditized that there are few competitive advantages that can be garnered from new technologies.<sup>3</sup> Obviously, public agencies are not in the business of seeking competitive advantages. However, imagine a situation in which CIOs are questioned on the value of IT. What evidence will CIOs use to make the case that IT does matter in the public sector? How will CIOs show that IT investments, coupled with disciplined management, can lead to transformative outcomes for an agency, optimize delivery of services, and increase effectiveness when it comes to the attainment of organizational objectives?

## Federal Performance Management Initiatives: A Brief Historical Review

Over the past 50 years, the federal government has made efforts to modify performance management practices (largely revolving around budget practices) to focus more on metrics. However, few have stood the test of time. The reforms include:

- In 1965, President Lyndon B. Johnson introduced the Planning-Programming-Budgeting System (PPBS) that integrated multiple planning and budgeting techniques to identify costs and complexities in order to forecast costs.<sup>4</sup>

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2. Defense major automated information systems. (February 2015). GAO, Washington, D.C. Retrieved April 7, 2015, from [www.gao.gov/assets/670/668718.pdf](http://www.gao.gov/assets/670/668718.pdf); Trinity returns, DCS debuts, senators back IGs and DoD metrics. (February 26, 2015). Retrieved April 7, 2015, from [fcw.com/articles/2015/02/26/news-in-brief-february-26.aspx](http://fcw.com/articles/2015/02/26/news-in-brief-february-26.aspx).

3. Carr, N. (May 2003). IT doesn't matter. *Harvard Business Review*. Retrieved April 7, 2015, from <https://hbr.org/2003/05/it-doesnt-matter>.

4. The American presidency project. (August 25, 1965). Retrieved April 7, 2015, from [www.presidency.ucsb.edu/ws/?pid=27182](http://www.presidency.ucsb.edu/ws/?pid=27182).

- In 1973, President Richard M. Nixon initiated Management by Objectives (MBO) that emphasized participative goal setting and actual performance measurement.<sup>5</sup>
- In 1977, President Jimmy Carter introduced Zero-Based Budgeting (ZBB) that focused budgeting on the measurement of need rather than on historical allocations.<sup>6</sup>

Each was well intentioned, with the goal of improving performance management practices. Each of these reforms has been judged to have failed either due to poor implementation or to simply being allowed to fall by the wayside.

In the 1990s, Congress passed performance management legislation that would have staying power. In 1993, Congress passed the Government Performance and Results Acts (GPRA) to improve stewardship of public resources by linking resources and management decisions with program performance.<sup>7</sup> Although not specifically developed for IT, the GPRA created a foundation for performance measurement in the public sector that would impact future IT projects. The GPRA required agencies to:

- Develop comprehensive five-year strategic plans, complete with outcome-based goals and objectives
- Delineate annual performance plans to explicate the operational processes, skills, technology, and resources required for each program or activity
- Prepare year-end reports to compare the actual performance with the plan for the fiscal year<sup>8</sup>

In 2010, the GPRA was extended and was transformed into the GPRA Modernization Act of 2010 (GPRAMA).<sup>9</sup> The GPRAMA requires OMB to coordinate with other federal agencies to develop long-term, outcome-oriented goals every four years in cross-cutting policy areas.

Annually, OMB must now provide information on how these goals will be achieved. To ensure that performance data is used and not just collected, the GPRAMA requires goal leaders to complete quarterly reviews of priorities called Cross-Agency Priority (CAP) goals.<sup>10</sup> CAP is a tool for leadership to achieve success in priority areas that require collaboration between multiple agencies. One of the 15 CAP goals focuses on benchmarking. The aim of this CAP goal is to improve administrative efficiency and effective management by establishing cost and quality benchmarks in five areas, one of which is IT. The IT benchmarking initiative is discussed further on page 13. (The other four benchmark areas are human capital, financial management, acquisitions, and real property.)

## IT-Specific Performance Management and Metrics Programs in the Obama Administration

OMB plays a key role in the development and oversight of federal investments into IT by working with agencies to plan, justify, and determine how to manage their portfolios. OMB also assists agencies in developing business cases for potential IT investments and establishes

5. Kelly, J. M., & Rivenbark, W. C. (2014). *Performance budgeting for state and local government*. London, UK: Routledge.

6. Zero-based budgeting. (July 1977). Office of the Librarian, Washington, D.C.

7. Government Performance and Results Act of 1993. (Public Law 103-62).

8. Radin, B. A. (1998). The Government Performance and Results Act (GPRA): Hydra-headed monster or flexible management tool? *Public Administration Review*, 307-316.

9. GPRA Modernization Act of 2010. (Public Law 111-352).

10. GPRA Modernization Act provides opportunities to help address fiscal, performance, and management challenges. (No. GAO-11-466T). (March 2011). GAO, Washington, D.C.

management processes for monitoring investments. Through initiatives such as the IT Dashboard, TechStat, and PortfolioStat, OMB has focused its efforts on improving IT project management to prevent wasted resources. As explained below, these efforts are making strides toward improving performance management; however, most remain incomplete and need further development.

On July 25, 2013, David A. Powner, director of IT management issues at GAO, testified to Congress that:

The federal government continued to spend billions of dollars on troubled IT investments and we identified billions of dollars' worth of failed and challenged IT projects.<sup>11</sup>

### The IT Dashboard

In 2009, the IT Dashboard was introduced by OMB. The IT Dashboard is a public website that visually presents performance ratings for agency IT investments based on metrics related to cost, schedule, and the agency CIO's evaluation. Data presented is meant to show near real-time performance ratings on investments.

A valuable feature of the site is that it requires government transparency in the acquisition and management of new and legacy IT investments. For instance, as of May 2015, the IT Dashboard revealed that 178 out of 738 (a total cost of \$8.7 billion) of the federal government's IT investments were in need of management attention. The IT Dashboard provides several additional benefits:

- Visualizations of IT investment data such as a treemap, bubble charts, line graphs, and bar graphs
- A data quality report that allows agencies to review investments with the potential of having quality issues in six major categories
- An investment dashboard that includes operational performance, contacts, business case archives, investment change history, and other investment metrics

In its review of the IT Dashboard, GAO found some inconsistencies in data reported in the Dashboard:

- GAO questioned the accuracy of the data reported in the Dashboard. It found that agencies are reporting their information in various ways that increase variances in data. One issue for concern was the presence of inaccurate baseline information across multiple agencies. For example, the Department of Justice's (DoJ) Law Enforcement Wireless Communication investment has re-established its baseline four times, despite the fact that program officials stated that the program baseline had only been re-established once.<sup>12</sup>
- Reporting standards are not followed. For instance, the Department of Veterans Affairs (VA) did not update its ratings regularly because it did not have the ability to automatically submit its ratings for 10 months.
- OMB does not regularly update the Dashboard. For example, the DoJ downgraded one of its investments in July 2012, but that update was not reflected until April 2013.<sup>13</sup>

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11. Information technology: OMB and agencies need to more effectively implement major initiatives to save billions of dollars. (No. GAO-13-796T). (July 25, 2013). GAO, Washington, D.C.

12. OMB's dashboard has increased transparency and oversight, but improvements needed. (No. GAO-10-701). GAO, Washington, D.C.

13. Ibid.

## TechStat Sessions

OMB initiated TechStat in 2010 to serve as a face-to-face, evidenced-based accountability review of IT investments using data from the IT Dashboard and other sources. A TechStat is a session between OMB officials and agency leadership during which IT investments are reviewed. A TechStat session is triggered when an agency determines that one of its projects is underperforming. The session includes a briefing on the management of the investment, performance data, and opportunities for corrective action (where next steps and a formalized action plan are produced).

As a result of TechStat, agencies have achieved the following benefits:

- The Nuclear Regulatory Commission found that reducing the scope of its License Fee Billing System made available \$800,000 for other organizational priorities
- DoD restructured its Mission Planning System Increment 4 program to focus on enhancing capabilities on a specific area of the system
- The VA Performance Management Accountability System used TechStats to help monitor and evaluate the status of the project

TechStat sessions boost measurement of IT programs, increase timely interventions, and strengthen IT governance. In addition to the formal OMB-hosted TechStat sessions, agencies are encouraged to facilitate their own internal TechStat sessions. According to OMB, TechStat sessions were very effective, and resulted in a savings of nearly \$4 billion in life cycle costs in 2011 alone.

In its review of TechStat, GAO was unable to verify the accuracy of these claims due to a lack of data collection protocols that would unequivocally verify financial savings.<sup>14</sup> As with the IT Dashboard, the benefit of the program is clear; however, more work is needed to improve the tool.

## PortfolioStat Reviews

In 2012, PortfolioStat was introduced by OMB. PortfolioStat is a review process for portfolios of IT projects to identify opportunities to consolidate IT services and increase shared-service delivery models of IT projects and systems. PortfolioStat reviews pay special attention to commodity IT investment, potential duplications, investment alignment to agency mission and business functions, and other IT considerations. Under PortfolioStat, all 26 of the largest federal agencies are required to:

- Complete a high-level IT survey
- Establish a commodity IT investment baseline
- Hold a PortfolioStat session
- Submit a plan to consolidate commodity IT
- Migrate at least two duplicative commodity IT services

OMB projected that PortfolioStat would save the federal government \$2.5 billion between FY 2013 and FY 2015.<sup>15</sup> Through the critical review of IT investment maturity and the discovery of ways to maximize return on investment, PortfolioStat offers the potential to

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14. Additional actions and oversight urgently needed to reduce waste and improve performance in acquisitions and operations. (No. GAO-15-675T). (June 2015). GAO, Washington, D.C.

15. VanRoekel, S. (March 27, 2013). PortfolioStat 2.0: Driving better management and efficiency in federal IT. Retrieved April 7, 2015, from <https://www.whitehouse.gov/blog/2013/03/27/portfoliostat-20-driving-better-management-and-efficiency-federal-it>.

significantly help improve agency IT functions. Additionally, in 2015, OMB announced that it would place PortfolioStat metrics that are used internally on the IT Dashboard site as well as in its outputs.

In its review of PortfolioStat, GAO found two major weaknesses:

- First, OMB struggled to ensure compliance with the program—only 1 of 26 participating agencies addressed all requirements.
- Second, while OMB claimed that the program saved \$3.7 billion through FY 2015, GAO found that sufficient support for financial claims was not always provided.

In response to these challenges, in 2015 PortfolioStat was enhanced to better reflect the federal IT core objectives:

- Drive value in federal IT investments
- Deliver world-class services
- Protect federal assets and information<sup>16 17</sup>

### Federal Data Center Consolidation Initiative (FDCCI)

Another Obama administration initiative includes measures to implement best practices that align business and IT operations, such as risk management approaches to cybersecurity, and the regular review of the agency portfolio. The FDCCI was created to substantially consolidate and stem the growing number of federal data centers (i.e., according to OMB, the federal government had 432 data centers in 1998 and over 1,100 in 2009) by reducing the cost of software, hardware, and operations and shifting cost to more efficient platforms—while promoting more sustainable uses of IT.<sup>18</sup> In particular, the FDCCI will require agencies to inventory their data centers, develop strategies to maximize the utilization of data centers, reduce energy costs through consolidation, and develop metrics to measure their success and savings.

Appendix II contains 11 metrics used to measure agencies' progress toward optimizing data developed by the Data Center Consolidation Task Force.

### Establishing Cost and Quality Benchmarks for IT

"Mission-Support Benchmarking" was selected as one of the administration's 15 Cross-Agency Priority (CAP) goals. The mission-support benchmarking goal aims to improve administrative efficiency and the use of effective management practices by establishing cost, quality, and customer satisfaction benchmarks for mission-support operations. Five mission-support operations are included in the initiative: acquisition, financial management, human capital, IT management, and real property.

For each of the five mission support operations—including IT—its respective cross-agency council (e.g., the CIO Council for IT) developed about two dozen metrics that addressed cost, efficiency, and quality. The specific metrics were selected based on their value in providing better information to decision makers. Table 1 on page 14 presents a summary of work to date on developing IT metrics for the federal government.

16. IT Dashboard, FY 2016 edition. IT Performance Metrics (Beta). Retrieved April 29, 2015, from [https://itdashboard.gov/it\\_performance\\_metrics](https://itdashboard.gov/it_performance_metrics).

17. CIO Council Operations. OMB opens door into PortfolioStat Metrics. CIO.gov. Retrieved April 29, 2015, from <https://cio.gov/omb-opens-door-into-portfolio-stat-metrics/>.

18. Data center consolidation. (No. GAO-14-713). (September 2014). GAO, Washington, D.C. [www.gao.gov/assets/670/666123.pdf](http://www.gao.gov/assets/670/666123.pdf).

The five sets of metrics all address questions such as:

- How efficiently is my function providing services when compared to my agency peers?
- How do our agency's bureaus compare to one another on relative administrative costs and performance?
- Are certain processes that we currently provide in-house good candidates for consolidation or shared services?

In 2015, for the first time, the five sets of metrics were the basis of structured conversations between OMB and key leaders in each of the 24 departments or major agencies in "FedStat" meetings. The conversations focused on two key questions: What do we need to fix? How do we prioritize the actions needed? It is anticipated that this will lead to targeted, data-driven discussions among CIO council members in months to come, regarding best practices and lessons learned.

**Table 1: Cross-Agency IT Metrics in 2015**

<b>Cost and Efficiency Measures</b>	
<b>Function-Wide Measures</b>	<ul style="list-style-type: none"> <li>• IT spend as a share of total agency spend</li> <li>• IT development, modernization &amp; enhancement spend as a share of IT operations &amp; maintenance (O&amp;M) spend</li> </ul>
<b>Process-Specific Measures</b>	<ul style="list-style-type: none"> <li>• Cost per help desk ticket</li> <li>• Cost per terabyte of network storage</li> <li>• Network storage refresh year (Y/N)</li> <li>• Cost per desktop end user</li> <li>• Desktop services refresh year (Y/N)</li> <li>• Cost per e-mail inbox</li> <li>• E-mail refresh year (Y/N)</li> </ul>
<b>'Quality of Service' Measures</b>	
<b>Operational Quality</b>	<ul style="list-style-type: none"> <li>• %, Help desk tickets escalated above Tier 1</li> <li>• Help desk first contact resolution rate</li> <li>• Help desk abandonment rate</li> <li>• Help desk speed to answer</li> <li>• %, Network storage uptime</li> <li>• Total number of desktop configurations</li> <li>• %, E-mail uptime</li> <li>• E-mail inbox, maximum storage</li> </ul>
<b>Customer Satisfaction</b>	<ul style="list-style-type: none"> <li>• Satisfaction with the quality of support and solutions in the following IT service areas: <ul style="list-style-type: none"> <li>• E-mail</li> <li>• IT equipment</li> <li>• IT help desk</li> <li>• Design, modification and enhancement</li> <li>• Network storage</li> <li>• Operations &amp; maintenance (O&amp;M)</li> </ul> </li> </ul>

**Source:** Cross-Agency Priority Goals: Benchmark and Improve Mission Support Operations, The Office of Executive Councils, General Services Administration.



# The State of IT Metrics Today: Challenges and Findings from Interviews

## Challenges

This section highlights several challenges that CIOs face when trying to develop programs and processes around IT metrics. These challenges—while significant—are not insurmountable, and innovative CIOs are now finding workable solutions to overcome them. The interviews identified the following challenges:

- **Challenge One:** Many IT metrics will depend on other organizational units meeting their performance targets
- **Challenge Two:** IT metrics require a focus on long-term planning
- **Challenge Three:** CIOs will need to coordinate efforts to integrate metrics and develop standards for comparison
- **Challenge Four:** IT departments must have the ability to collect real-time data on IT operations

### Challenge One: Many IT Metrics Will Depend on Other Organizational Units Meeting Their Performance Targets

Information systems, while critical, are only one part of the larger ecosystem of the organization when it comes to driving outcomes and achieving mission objectives. IT departments are dependent on the performance and strength of other units and the ability of other units to complete their tasks and assign resources in a timely manner. As such, IT metrics can be impacted both directly and indirectly by the performance of other units. For instance, we've all heard various reports about IT failures; however, when we delve more deeply, we often find that IT-related failures were impacted by several organizational elements that underperformed, such as organizational procurement policies and practices, political influence, internal organizational strife, poor organizational leadership, and a host of other organizational problems.

Furthermore, in many organizations, the IT department is relegated to a position on the periphery of strategic planning and serves more as a support function. An internal initiative developed to ensure an organization can meet its goals will often exclude IT during critical preliminary discussions, missing an opportunity to gauge the feasibility, security, and fit of the initiative with existing organizational systems. IT is usually called upon at a later stage, given specifications and timelines, and expected to deliver on those requirements. This type of peripheral involvement makes it extremely difficult for IT to develop and recalibrate meaningful metrics in any truly collaborative way. For instance, while IT might complete the technical specifications on a given system on schedule, the ongoing evaluation of the new system then would need to be done by the business unit requesting the new technology. If the requesting department does not complete the necessary review, the metrics will be negatively impacted.



Since IT is just one element in a larger ecosystem of the organization, IT departments also are dependent on their peer units for services. Additionally, CIOs are finding that they cannot be as effective as they would like to be because lengthy or complex organizational procedures keep them from moving quickly and aggressively to solve problems or increase viability. One CIO told us:

Some of our more difficult challenges are based in speed and flexibility. We work in a classified environment with built-in processes that slow down access to information...

IT procurement is not completely controlled by the IT department, and is dependent on accounting, finance, legal, and even public affairs units for procurement procedures and contracting policies which can affect the implementation of a Request for Proposal. Thus, the time it takes to implement new IT technologies and systems can be shortened or lengthened based on the processes, protocols, and practices of other organizational units. Moreover, CIOs are concerned with attempting to make strides in areas related to metrics but not having adequate authority over all aspects of a project.

### **Challenge Two: IT Metrics Require a Focus on Long-Term Planning**

Developing metrics takes time and effort. Organizational IT leaders often are dealing with immediate challenges that require their attention, which prevents them from focusing on more long-term goals. Forward thinking is a skill that many IT leaders have, but it is not one that they are able to utilize fully when the requirements of their organizations leave them encumbered by short-term issues. This challenge then trickles down to employees, where they are focused on current issues or problems instead of on future planning.

This is problematic for metrics development because metrics programs often require upfront investments in data collection and analysis that only will bear fruit over time. It is difficult for CIOs to justify spending significant chunks of time on developing a metrics program—as outlined in the recommendations section, it takes effort to go through the stages of designing, implementing, and evaluating—when there are real, material challenges that the organization is dealing with on a day-to-day basis. One CIO stated that “building a performance management function for our IT department is a long game.... I do not know if it is worth it, given that I have other major priorities to deliver on and have less resources than ever before.”

When asked his opinion on other federal agencies’ ability to develop quality metrics, one CIO stated:

I think most [federal agencies] are struggling. It’s a lot of pressure from the politicians to deliver capability and not spend much money on the analytics side—although I think people understand if we spent a little bit of money on the analytics we might save money on the cost of IT. I can’t spend the money to avoid fires.... I just gotta keep fighting them.

### **Challenge Three: CIOs Will Need to Coordinate Efforts to Integrate Metrics and Develop Standards for Comparison**

In environments where IT assets are distributed across multiple departments, bureaus, or units, it becomes very important for the CIO to find ways to share best practices when it comes to designing and implementing IT metrics programs. In some environments, especially at the state and federal levels, CIOs might have limited resources and influence over the IT

leaders in other units. As such, these CIOs must find ways to coordinate practices and develop knowledge-sharing platforms.

CIOs also must find better ways to coordinate metrics found in the local units to track IT asset performance at the global level. One CIO noted that a chief challenge of being in a federated organization is the difficulty of aggregating IT performance measures. His organization includes over 30 bureaus and components, each of which has its own IT operations. To improve IT performance as an organization, leaders often develop a CIO Council made up of CIOs from all corners of the organization in order to establish a “Top 10 Metrics” list. Members of the CIO council highlight their area’s particular needs, practices, and challenges for their colleagues. The CIOs are then called to advocate on behalf of their recommended metrics and how they will fit with the concrete needs and subcultural practices of the organization.

An added benefit of figuring out how to harness collaboration throughout the organization is gaining insight into the challenges, connections, and interactions between other offices, departments, or bureaus. Growing this collective knowledge within the organization creates valuable learning opportunities.

#### **Challenge Four: IT Departments Must Have the Ability to Collect Real-Time Data on IT Operations**

Collecting data for metrics is not cheap. When organizational units across local, state, and federal agencies are asked to perform better with the same, or less, funding, important programs are not started or fall by the wayside. Since it takes time and effort to collect and analyze data, metrics programs often do not receive the attention they deserve. Thus, even when they are implemented, they are not implemented at an optimum level that would, in turn, help achieve greater organizational awareness of performance.

Moreover, some metrics programs are not implemented in real time, which creates lags in awareness and action. When metrics are not collected and analyzed in a timely manner, it can become too late to create interventions to resolve issues. Furthermore, metrics not collected in real time can largely create analyses that are focused on looking for problems, and not on taking advantage of opportunities for optimization and innovation.

To truly meet the needs of the larger organization, CIOs must collect data in real time and make decisions based on those data. It is not enough simply to collect the data. Some CIOs are collecting data for their city manager or for an annual report that is published online. Use of the data by decision makers is also required to secure better performance. For CIOs to do all of these things, better collaboration across the organization as well as more attention to metrics are needed.

### **Findings**

Based on our interviews with CIOs at the federal, state, and local levels, we had five key findings:

- **Finding One:** CIOs recognize the value of metrics
- **Finding Two:** CIOs are adept at managing through metrics for outsourced contracts
- **Finding Three:** CIOs are participating in agency strategic planning processes
- **Finding Four:** CIOs use metrics for benchmarking, but with caution
- **Finding Five:** CIOs need to carefully manage IT metrics around cost

### Finding One: CIOs Recognize the Value of Metrics

The CIOs interviewed for this report recognized the valuable role that metrics can play when it comes to the management of an IT department, governance of an IT infrastructure, and the delivery of IT projects. Specifically, CIOs found that having good metrics helped them in the following ways:

- **Project Management.** CIOs noted that much of the value of metrics is in their ability to signal the current trajectory of various efforts and to alert the CIOs to oncoming issues and challenges.
- **Transparency.** CIOs noted that metrics bring a level of transparency when it comes to performance evaluation and resource allocations. A CIO stated:

I just feel more comfortable managing by empirical data.... If I got a complaint about something, I could go to my metrics and confirm if it is an isolated incident or a bigger problem.

Another CIO reflected:

Instead of IT just being a black hole, there's a lot better understanding of the quality of work going on. It helps us be better and more transparent. Our staff has a big voice in what the metrics are and what the goals should be, which helps them want transparency.

- **Seeing the Bigger Picture.** Many CIOs pointed out that metrics help them see the big picture when it comes to IT performance, rather than focusing on singular incidents. CIOs noted that often their employees were under pressure and/or criticized for IT failures when they occurred. However, looking at the metrics enabled them to identify whether the failure was an isolated incident or a repeated pattern. One CIO stated:

We all make mistakes. Unfortunately when it comes to IT we are more aware of these small hiccups as they are visible.... If your e-mail is down you know it, as you are on it more than ever before, and somehow you do not know what to do with yourself for the three minutes we needed for an unplanned security patch fix.... You will remember the three minutes and not the 99.99999% of the time that your e-mail worked seamlessly across a host of platforms, devices, and environments.

### Finding Two: CIOs Are Adept at Managing Through Metrics for Outsourced Contracts

Given that public agencies rely on contractors for the delivery of many IT services, most CIOs appear to be skillful in managing metrics associated with outsourcing contracts. Service-level agreements (or SLAs) drive the design of metrics used to capture performance of the contract. SLAs outline major aspects of services such as quality, scope, delivery time, and responsibilities that are agreed upon by the customer and vendor. For example, a data center might agree to server-level availability of 99.9% uptime on midrange servers. SLAs also provide the customer with rights and remedies in the form of service-level credits if the provider fails to meet the agreed-upon levels of service and consequently will reduce the provider's profit margin.

### Finding Three: CIOs Are Participating in Agency Strategic Planning Processes

Most CIOs in the public sector are now getting a seat at the proverbial "big" table when it comes to developing agency-wide strategic plans. The FITRA legislation (see box) will give CIOs additional responsibilities and authorities to help shape agency strategic plans. CIOs

## **The Federal Information Technology Acquisition Reform Act: A Stronger Role for Federal CIOs Can Enhance IT Performance Metrics**

The Federal Information Technology Acquisition Reform Act (FITARA), passed in 2014, enacted changes to the governing and management of information technology (IT) in the federal government. Amid significant challenges with IT procurement strategies and project execution, FITARA was developed to increase efficiencies, provide cost savings, provide better services to citizens, and limit the number of IT project failures. The most significant changes FITARA made to IT governance were strong mandates for chief information officers (CIOs) and the clarification of their role within their organization, their power, and responsibilities.

New authorities that FITARA vests in the CIO are significantly increased responsibility and authority over IT functions within the agency. Prior to the law, many CIOs did not have clear authority within their organization to manage IT. Authority and responsibility were often split, making IT management a tangled web that frequently reduced responsibility and clear accountability for project failures. Today authority for hiring IT personnel, approving IT budgets, and signing IT contracts is now subject to the CIO's approval.

To establish clear lines of authorities and government-wide IT management controls, agencies now are required to set a common baseline for roles, responsibilities, and authorities. This baseline will come from a self-assessment and implementation plan that each agency will conduct and submit to the Office of Management and Budget (OMB). This baseline will become a basic set of requirements that explains how CIOs will interact with agency chief acquisition officers (CAOs) and chief financial officers (CFOs). It also outlines CIO mandates such as the CIO's inclusion in IT program planning at the agency component level, in final project approval, and on boards that use IT resources as well as the agency's Investment Review Board.

The baseline also designates that the CIO will define development processes, milestones, policies for capital planning, and IT resource reporting. This ensures that CIOs are creating processes that certify and review IT resources. Additionally, recognizing that placing too much responsibility on the agency CIO could create bottlenecks, FITARA added delegation responsibilities. CIOs will, however, still have the ultimate responsibility for IT functions within the agency. This keeps expectations of accountability and responsibility realistic, while creating new methods for governing IT projects within agencies and keeping the CIO as a strategic player across the organization.

To achieve the targeted changes of FITARA, agencies will have to implement transparency and review methods. CIOs will work with other program managers to outline strategic objectives and create IT performance metrics. Monthly reports that include updates via performance metrics and activity data for major IT investments will be submitted to OMB. If data reported is not timely or deemed unreliable by the CIO, the CIO must notify OMB and develop a plan to find and resolve the problem.

FITARA offers the opportunity for federal agencies to enhance the use of metrics in developing more evidence-based approaches to managing IT. Efforts such as baselining and sharing data will prove useful towards the creation of metrics. In addition, metrics focused on costs for services, acquisition, and maintenance of systems will become useful tools to streamline the management of IT in the public sector. Analytics, such as the identification of spending patterns, vendor-specific analysis for performance on contracts, and more rigorous project analysis can result if data on key metrics are captured and analyzed rigorously.

interviewed for this report described the value of engaging with strategic planning processes and designing strategic plans for their units. The strategic planning process is one that requires CIOs to:

- Communicate with key stakeholders across the agency and discuss the role of IT and the expectations of IT assets
- Align the strategic intentions, plans, and metrics of the IT department with the overall agency goals. CIOs are seeing good results when they take this level of engagement seriously and invest the necessary resources.

One state CIO noted that aligning with other agencies to build consensus is necessary. He noted:

You cannot be an island. You have to be part of the entire process.  
The best way is to sit down and talk to people.

#### **Finding Four: CIOs Use Metrics for Benchmarking, But with Caution**

CIOs report using metrics for benchmarking. Yet, benchmarking is difficult due to the lack of reliable information on what other agencies are doing and the ability to compare apples to apples. CIOs do find benchmarking useful. One CIO shared his experience of successfully using benchmarking to support his request to his city council to hire more employees. He recalls using benchmarking metrics to create charts and graphs to reflect his city benchmarked against comparable cities to reflect his city's lower performance. Visually reflecting his city's need to improve performance helped to gain council member buy-in. He stated that, if one wants better services, one must "visually show and justify it."

However, CIOs are aware of benchmarking's limitations, because access to resources varies from agency to agency. A small number of CIOs think benchmarking can actively hurt the health and growth of public sector IT. One CIO stated that:

You can't lump them all together. You can't compare metrics on one project to another because two are never the same. You have to set your own standards based on what you promised for delivery and based on what's going on.

Despite their caution with benchmarking, CIOs remain hopeful. A local government CIO said:

(I am) constantly interested in other IT departments, other localities, their metrics, the reasoning behind their metrics, and what they are doing.

Another CIO noted:

We're always going to have the on-budget, on-schedule metrics related to projects in development, but really, there needs to be better information on metrics related to steady state projects or programs like customer satisfaction and customer value metrics.

#### **Finding Five: CIOs Need to Carefully Manage IT Metrics Around Cost**

The very nature of the public sector is oriented toward service delivery and cost efficiencies. Organizations are increasingly vigilant over the dollars they expend and the value received for those dollars. However, cost or price-point metrics may achieve cost savings, but not neces-

sarily cost effectiveness, if not managed carefully. A state CIO noted:

I know a lot of what we're trying to do is get away from measuring technology widgets and more towards what do services cost you.

For example, price-point metrics are navigational metrics that measure cost in relation to the return on investment (ROI). Price-point metrics have pros and cons to their usage. In most state governments, IT organizations are cost recovery agencies. Because there is a direct correlation, politically, between the IT and budgeting processes, many metrics are price-point related.

One state CIO noted price-point-oriented conversations with political officials as a positive because they outline clearly the amount of money needed to get certain outcomes. Price-point metrics help reflect the value an organization is receiving for its money. Most IT organizations are sharing services, so being able to make valid arguments around a unit price metric (i.e., cost per megabyte, cost per circuit, cost per virtual storage) offers IT more leverage and negotiating power with political officials and vendors.

# A Framework for Developing a Balanced Portfolio of IT Metrics

Data-driven leadership helps articulate value, link success to operations, drive innovation, save money, improve relationships, bring critical issues to the foreground, and eliminate waste. Unfortunately, standardized IT metrics do not exist in the public sector. Agencies employ a suite of metrics that gauge the health and performance of the IT department and the entire organization based on their needs, leadership, organizational structure, and goals.

Analysis from our research revealed that most IT metrics now used by IT managers can be classified into three broad categories that would comprise a balanced portfolio of metrics:

- **Project management.** This set of metrics is used to assess project management focus on ensuring that work products and processes of the IT unit are meeting performance expectations and standards.
- **Operations management.** This set of metrics seeks to capture the health of the overall IT unit from an infrastructure, resource, and personnel viewpoint.
- **Innovation.** This set of metrics can provide critical indicators on the future viability of the IT unit to reinvent itself to stay relevant given technological breakthroughs and environmental dynamism.

## IT Metrics to Assess Project Management

The majority of work within an IT department gets executed through *projects*. Project management capabilities of an IT department can be clearly linked to the ability to deliver value to stakeholders both within and beyond the agency. Most CIOs we spoke to were well versed in the standard set of metrics proposed by the Project Management Institute's *Project Management Body of Knowledge (PMBOK) Guide*.<sup>19</sup> Most agencies had a suite of traditional IT metrics to measure project value (e.g., tracking actual cost versus budgeted cost), delivery (e.g., measuring schedule variance and requirements/scope changes), personnel (e.g., turnover of personnel during a project), client satisfaction (e.g., defect reporting and response rates and stakeholder reviews), compliance (e.g., scores on audit and security reviews), and performance (e.g., usability and adoption).

As noted in Finding Two (page 18), CIOs are adept at measuring project performance through the use of SLAs. Given the prominence of IT outsourcing contracts in the public sector, measuring through SLAs is a critical capability to ensure that IS projects are being delivered on time, on schedule, and within budget while meeting stakeholder expectations. SLAs are a formal method of measuring performance based on predetermined, mutually agreed-upon standards. By using a combination of legal and financial penalties for not meeting those standards, SLAs create a

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19. Project management body of knowledge (PMBOK guide), 5th Edition. (January 2013). Project Management Institute, Newtown Square, PA. <http://www.pmi.org/pmbok-guide-and-standards/pmbok-guide.aspx>.



formal client-provider relationship between the public sector organization and the external partner.<sup>20</sup> The terms of SLAs should be negotiated and agreed upon carefully to prevent terms that are not beneficial to all parties. For instance, in 2002, the City of Minneapolis entered into a contract to manage the city's IT infrastructure. Minneapolis officials encountered a problem with the definition of service-desk protocols in the SLA. The SLA outlined an average answering time of less than 45 seconds; however, the SLA did not guarantee timeliness in the response to a call, so callers would be answered initially within 45 seconds of calling but could be kept on hold waiting for assistance for various amounts of time.<sup>21</sup>

The use of SLAs requires the modification of metrics over time. For instance, the Georgia Technology Authority contracted to coordinate and oversee the integration of services for the Georgia Enterprise Technology Services program. The contractor will integrate billing, processes and systems, risk and security management, service desk management, and other services. To ensure that the contractor delivers on its responsibilities as the lead integrator, service-level metrics on 28 processes that measure performance were implemented. The 28 processes are based on the needs of other agencies within the state.<sup>22</sup> In order to maintain quality, the state will adjust the metrics over time.

CIOs did report two challenges when it came to project-specific IT metrics, including:

- **The majority of the focus of IT metrics was on measuring the performance of projects during the design, build, and implement phases.** While this is good, CIOs noted that they needed to become more engaged in ensuring that metrics also are captured on a routine basis post-implementation to alert them to impending system-level issues (e.g., system obsolescence and maintenance) earlier on—in much the same way that a printer gives warning signs that the ink cartridge may need to be replaced well before the time that the print function fails. Similarly, CIOs wanted to take a more proactive stance of measuring the health of systems after delivery to the client rather than simply to rely on clients to get aggravated with performance and then complain.
- **CIOs struggle with identifying good measures to capture the value of projects to the overall organization.** CIOs know how to measure the value of the project when it comes to streamlining administrative processes through automation or improving work through innovative deployment of technologies (e.g., mobile platforms to engage with citizens). CIOs struggle to take these gains and link them to overall agency objectives. One reason for this struggle is the number of intermediaries through which IT interventions have to work to make an impact. For example, one has to link IT tools to changes in business processes, which then have to be linked to employee productivity and satisfaction, which may in turn link to superior delivery of services, that will ultimately impact the reputation of an agency or citizens' trust in the agency. Making these connections, either causally or through correlations, is seldom easy or even feasible. As such, IT project successes are often buried when it comes to identifying their direct contribution to agency mission successes.

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20. Nazemoff, V. How to overcome internal SLA misconceptions. (May 4, 2015). <http://www.cio.com/article/2917358/governance/internal-service-level-agreements-why-and-how-to-overcome-hesitation-and-misconceptions.html>.

21. Collins, H. Five tips for outsourcing or sharing IT resources. (November 29, 2009). [http://www.governing.com/templates/gov\\_print\\_article?id=99264554](http://www.governing.com/templates/gov_print_article?id=99264554).

22. Heaton, B. Georgia expects better tech oversight with multisource systems integrator. (June 17, 2015). [http://www.governing.com/templates/gov\\_print\\_article?id=307943891](http://www.governing.com/templates/gov_print_article?id=307943891).



**Table 2: Illustrative Metrics to Assess Project Management**

<b>Employee Productivity</b>	<ul style="list-style-type: none"> <li>• Cost per hire</li> <li>• Revenue per employee</li> <li>• Absence rate</li> <li>• Cost/benefit ratio</li> <li>• Employee satisfaction</li> <li>• Turnover rate</li> <li>• Turnover costs</li> <li>• Workers compensation</li> <li>• Time to fill vacancy</li> </ul>
<b>Schedule</b>	<ul style="list-style-type: none"> <li>• Number of projects in progress</li> <li>• Number of projects in progress at 30, 60, and 90 days</li> <li>• Adherence to schedules</li> <li>• % of projects completed on time</li> <li>• % of projects completed late</li> <li>• Mean project completion time</li> </ul>
<b>Budget</b>	<ul style="list-style-type: none"> <li>• Amount of budget spent on new IT projects</li> <li>• Amount of budget spent on prototyping and experimenting with emerging technologies</li> <li>• Actual costs, to date</li> <li>• Largest variance line item/amount</li> <li>• Cost performance index</li> <li>• Schedule performance index</li> <li>• % over budget</li> <li>• Annual budget</li> <li>• Planned value by project</li> <li>• Operational budget change from prior year</li> <li>• % of organizations expecting to spend more than budgeted for IT operations</li> <li>• Total spending per user</li> <li>• Total IT spending as a percentage of revenue</li> <li>• Amount of project budget that is on track</li> <li>• Amount under budget</li> <li>• Amount over budget</li> <li>• Average contractor cost</li> </ul>
<b>Organizational Client Satisfaction</b>	<ul style="list-style-type: none"> <li>• Customized project metrics as decided collaboratively by customers, collaborators, and the IT department</li> <li>• % of intended objectives achieved</li> <li>• Client satisfaction</li> <li>• Client satisfaction scores assessed through surveys</li> <li>• Client retention rate</li> <li>• Number of IT personnel on non-IT projects, to capture the contribution to the overall organization and the value of the IT perspective</li> <li>• Incidents with SLA/Total incidents</li> <li>• Infrastructure availability/reliability</li> <li>• Operations support</li> <li>• Client loyalty</li> </ul>

## IT Metrics to Assess Operations Management

Operations management metrics give CIOs and other IT managers situational awareness of their department's performance, resources, personnel, and strategic activities. These metrics should:

- Provide a gauge for the health of the overall IT department
- Be able to track how each ingredient within the IT department is advancing the goals of the unit
- Signal areas in need of intervention to address current challenges and be ready to take advantage of future opportunities

All CIOs interviewed noted that they have a very good inventory of metrics when it comes to sensing and measuring the performance of their technical infrastructure. As one CIO told us:

We know every detail of our technical system, up to the very minute how a given system is performing... I wish we had the same level [of] detail on our non-tech assets.

At the operational level, the focus of operations management metrics is to ensure that resources and assets are being deployed optimally. For instance, the Arkansas Department of Information Systems (DIS) developed metrics for its 28 categories of services. One, in particular, was for its telephone data networking services. Through operations metrics that measured how much the agency pays for long-distance services and how much it billed for services, it found that it was underbilling for services provided. The DIS found that there were call minutes unaccounted for because its system did not have the appropriate customer identifier in the system to assign the charges.<sup>23</sup> Without the operations metrics, underbilling probably would have continued.

For operations to improve, metrics—such as those related to continuous improvement—are paramount. Continuous improvement places attention on cost, quality, and the delivery of projects and services. For instance, *cost efficiency improvements* metrics measure savings or improvements to projects where cost savings are measured against the cost between baseline options and alternative options. This allows managers to see if their efforts are really paying off, are not making a difference, or are counterproductive. For instance, organizations can often implement cost-savings efforts by reducing human capital or lowering the amount of maintenance or services offered. For instance, an input in many organizations is the offering of training and professional development. In lean times, these offerings might be seen as an employee perk and could be done away with. However, these efforts could be counterproductive, as they likely will end up costing the organization more money because increasing skill and knowledge levels within the organization is essential to meeting new demands. The *cost efficiency improvement* metric will help to spot this trend.

At a tactical and more strategic level, these metrics are used to uncover why key ingredients (e.g., infrastructure, personnel, etc.) are either not performing up to par, or what might be needed to increase their functionality and capabilities. Consider personnel metrics: These metrics can be as basic as employee salary and number of employees on staff. Other, more complex metrics can capture a number of bottom-line impacts within the organization. For instance, metrics such as employee absenteeism can measure absence rate, unscheduled absence rate, overtime expense, employee performance/productivity index, and overtime as a percentage of labor costs. These metrics reveal impacts on the organization related to the cost of replacement workers, decreased employee morale, and overtime pay due to absence.

23. Waxer, C. How governments are developing better performance metrics. (July 27, 2011). e.Republic, Folsom, CA. <http://www.govtech.com/policy-management/How-Governments-Are-Developing-Better-Performance-Metrics.html>.

**Table 3: Illustrative Metrics to Assess Operations Management**

<b>Overall Department Performance</b>	<ul style="list-style-type: none"> <li>• Total budget allocations per year</li> <li>• % of budget on strategic priorities</li> <li>• % of total projects exceeding planned value</li> <li>• % of total projects over budget</li> <li>• % of total projects on or below budget</li> <li>• Number of awards/accolades received by department</li> <li>• Cost performance index</li> <li>• % of hours by business priority</li> <li>• % of hours by business initiative</li> <li>• Cost by business initiative</li> </ul>
<b>Servers/Network</b>	<ul style="list-style-type: none"> <li>• %, Server uptime</li> <li>• %, End-to-end server performance</li> <li>• Root cause of outage category (e.g., power lines down, human accidentally unplugged server, glitch, etc.)</li> <li>• System load</li> <li>• Disk utilization</li> <li>• Disk utilization by application priority</li> <li>• Memory utilization</li> <li>• Disk I/O statistics</li> <li>• CPU utilization</li> <li>• Scheduled availability</li> <li>• Network performance</li> <li>• E-mail performance</li> <li>• Core systems performance</li> <li>• Website availability</li> <li>• Mean time to resolve incident</li> <li>• Average number of affected users by type of incident</li> <li>• Maximum number of affected users by type</li> <li>• Average system login time</li> <li>• Average response time</li> <li>• Average response time (peak hours)</li> <li>• %, Peak infrastructure utilization</li> </ul>
<b>Applications</b>	<ul style="list-style-type: none"> <li>• Application incidents</li> <li>• Application incidents (by application priority)</li> <li>• Application incidents (by incident severity)</li> <li>• Mean time to resolve</li> <li>• Mean time to resolve (by incident severity)</li> <li>• Mean time to resolve (by type)</li> <li>• Average number of affected users</li> <li>• Average number of affected users (by incident severity)</li> <li>• Average number of affected users for a single incident</li> <li>• Application incident resolution index</li> <li>• %, Downtime</li> <li>• %, Downtime (by application priority)</li> <li>• Maximum peak, downtime</li> <li>• Average application response time</li> <li>• Average number of users per day</li> </ul>

**Table 3: Illustrative Metrics to Assess Operations Management (continued)**

<b>Personnel</b>	<ul style="list-style-type: none"> <li>• Employees on staff</li> <li>• Employee salaries</li> <li>• Retirees and new hires</li> <li>• Personnel leaving the department for voluntary reasons</li> <li>• Personnel leaving the department for involuntary reasons</li> <li>• Employee sick days</li> <li>• Ratio of management to staff</li> <li>• Average duration of positions open</li> <li>• Turnover by position</li> <li>• Open positions</li> <li>• Average duration of open positions</li> <li>• Total contractors</li> <li>• Average length of contractor assignment</li> <li>• Average staff cost</li> <li>• Average contractor cost</li> <li>• Training and professional development courses completed by employees</li> <li>• Number of employees pursuing advanced degrees (e.g., MBAs, graduate courses in data analytics, security, etc.)</li> <li>• Number of employees holding professional certifications such as CISA (Certified Information Systems Auditor)</li> </ul>
<b>Continuous Improvement</b>	<ul style="list-style-type: none"> <li>• Cost efficiency improvements</li> <li>• Cost savings from efficiency improvements</li> <li>• %, Costs for value-added services</li> <li>• Cost by business initiative</li> <li>• Anticipating future benefits from technical investments</li> </ul>
<b>Security</b>	<ul style="list-style-type: none"> <li>• Availability of assigned systems</li> <li>• Security systems health score</li> <li>• User password changes</li> <li>• % of systems with known high vulnerabilities</li> <li>• % of systems without known high vulnerabilities</li> <li>• Mean time to patch systems</li> <li>• Number of security incidents</li> <li>• Number of discovered malware types</li> <li>• Number of malware agents remediated</li> <li>• Number of compromised clients</li> <li>• Number of risk assessments</li> <li>• Number of connected devices (clients, servers, network, other)</li> </ul>
<b>End User Customer Satisfaction Metrics</b>	<ul style="list-style-type: none"> <li>• Adoption rates of software applications</li> <li>• Usability of software applications</li> <li>• IT help desk service experience</li> <li>• IT help desk responsiveness</li> <li>• Availability of training and development programs</li> <li>• Experience with training and development programs</li> <li>• Software application usage rates</li> <li>• Software application obsolescence</li> </ul>

As noted in Challenge One (page 15), IT performance on operations is not exclusively within the department's control. IT is an enabler for many organizational functions, but only when paired with the proper managerial and oversight processes. Everyone must share in the development of goals and not think of themselves as separate entities. This type of alignment requires leaders to be engaged in shared governance.

As discussed in Finding Three (page 18), CIOs acknowledged that linking the performance of their IT unit to the overall goals of the organization is no easy feat. For one, IT is just one of the components within an overall program and only rarely is in the driver's seat. Yet, when things go wrong with the overall project, the IT department often takes a large share of the blame. Leading CIOs are not giving up on this challenge, and are working to "prove their salt." Consider Results Minneapolis, a public online dashboard linking 34 pages' worth of IT departmental performance measures to larger city values. One of the dashboard headings highlights the goal of having IT services and operations customer-focused and well managed. Metrics—like the number of IT projects in progress, the number of IT projects on budget, and expenditure per full-time IT employee compared to other departmental employees—are visualized as evidence of how well the IT department is performing. The IT department goals strive to push larger city goals forward and establish IT's worth in concrete terms. Other CIOs are looking at how to track the contribution of the IT department to projects that are transforming their agency, or how IT is fundamental to building new programs or implementing new policy options. CIOs are comparing the percentages of their budgets and resources that are allocated for these efforts versus those that are allocated for standard IT maintenance and basic computing resource provisioning.

## IT Metrics to Assess Innovation

Innovation is what many organizations are seeking in order to modify their operations, improve services, save money, and increase efficiency. Metrics on innovation are in their infancy, largely because of CIOs' need to maintain current operations and their lack of time to grow their operations. Additionally, metrics on innovation can be tricky because they require more than technology to be assessed. Because it is a multilayered concept, innovation can be captured by a variety of metrics working together to assess seemingly disparate aspects of organizational performance.

In seeking to develop indicators for innovation, CIOs are not the only group of government executives to confront this dilemma. In a recent IBM Center report, *A Managers Guide to Assessing the Impact of Government Social Media*, Ines Mergel described the challenges that government managers are now facing in developing indicators to assess the impact of social media use.<sup>24</sup>

In our interviews, CIOs noted their desire to capture the contribution of IT towards innovation in their organization and viewed this as a necessary undertaking. Metrics are even more important when we think of innovation efforts, as these efforts often are heavily scrutinized and are some of the first to get cut during difficult budget environments. Hence, metrics around innovation efforts (or high-risk projects) help keep the discussion focused on evidence rather than on hunches. CIOs reported the challenges of identifying key metrics to measure how IT contributed to the innovation agenda of their organization. When pushed on the reason why this might be, CIOs were quick to point out that a large share of their budget and resource commitments are tied to keeping existing systems up and running or working on incremental enhancements to existing systems.

The key metrics associated with innovation include capturing the amount of effort invested in exploring emerging technologies or innovative technology management methodologies, either within existing client-specific projects or in exclusive research and development projects. The former is where the IT department is infusing emerging technologies or approaches into a project; the latter is most often where the department has received a grant from an external agency and is undertaking an experimental effort.

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24. Mergel, I. *A managers guide to assessing the impact of government social media*. Washington, D.C., IBM Center for The Business of Government, 2014.

Agencies also capture details of employee and agency awards that signal innovation capacities or signature projects. At all levels of government, there are forums that rank CIOs based on innovation, give awards for innovative programs, and even evaluate the innovative climate of agencies (e.g., “best places to work” rankings). These are all indicators that offer IT departments a glimpse into their standing when it comes to innovation. Obviously, none of these measures are ideal, but they are nonetheless important. As one CIO noted, “We all hate rankings, but we all want to be recognized and would not mind moving up on the list.”

Innovation metrics also account for the percentage of the budget that is spent on projects that are not simply traditional maintenance or the extension of current information systems. For instance, projects that are focused on opening new pathways for citizen engagement, analytics, mobile communications, and cloud computing would all be considered innovative. Resources and budgets expended on these are compared to the overall budget. Most CIOs would like to “move the needle,” to a point at which greater effort is spent on designing the next generation of technologies and systems rather than on just “keeping the lights on.”

Finally, a few CIOs even captured details of their strategic partnerships with stakeholders that were focused around exploring innovative technologies, systems, or governance approaches. Most commonly, these came down to strategic engagements with academia, the private sector, and nongovernmental organizations (NGOs) on thematic issues. CIOs often spend time on advisory boards of academic IT departments, where they see their engagement with academia as part of the broader effort to bring new ideas and insights to their agency. Similarly, participation in professional forums by staff is viewed as an indicator of innovation. Knowledge exchanges at these forums enable CIOs to learn and collaborate with peers within and beyond the sector. Innovative CIOs often are sought out to deliver keynote addresses or presentations at industry conferences.

Interestingly enough, when CIOs were asked to highlight *outputs* of innovation efforts, they were readily able to list a number of applications, services, business process enhancements, and even strategic contributions that they thought were innovative. However, when asked about the *outcomes* of innovation, they struggled to come up with a list. As one CIO noted, “We do innovate things.... We, however, do not do the basics to capture the impacts of the innovations.” Capturing outcomes is no easy feat to accomplish, as normally it is the business units that capture the direct impacts of the IT-enabled innovations. Unless one is dedicated and spends effort to trace/tease apart the amount of impact that can be attributed to IT innovation, most of the impact will be reported and measured at the business unit level. However, CIOs are working creatively to capture outcomes. For example, one CIO measured the number of hours that were saved by professionals in real estate—and in licensing and zoning—in an urban area due to an IT innovation: a QR code system that automated the retrieval of land and building details on mobile phones. Prior to this innovation, the professionals needed to go to a physical office building to retrieve the necessary information. Although a seemingly small innovation, this CIO was able to roughly estimate the number of hours saved by real estate, licensing, zoning, and other professionals due to the real-time information availability, as well as to attribute the six-figure savings the city experienced to the innovation.

In 2008, the State of California’s CIO took on a monumental task of transitioning the California Natural Resources Agency (CNRA) to cloud computing via an innovative (at the time) approach during a time of dire financial straits. CNRA is made up of 29 departments that manage California’s energy, water, wildlife, coastline, and parks resources, each with their own operating system. The move to cloud computing was a challenge due to organizational cultural and financial challenges. However, when the cloud technology was implemented, CNRA was able to know that it was an innovation by performance and operations outputs such as increased storage capacity, reduced physical footprint, decreased expenses, and enhanced service

delivery.<sup>25</sup> This type of innovation and performance improvement offers more opportunities to do other things (such as more innovation) with the dollars and employee time saved.

**Table 4: Illustrative Metrics to Assess IT Innovation**

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

Innovation growth must also go beyond traditional measures of return on investments. Indicators based on monetary value are not enough. For example, looking at stakeholders is an important way to gauge innovation. The metric for the *percentage of CIOs and key functional managers' time spent on charting the future (strategic innovation) rather than on day-to-day operations* affixes formal numbers to time spent working on innovation rather than passively making the time an afterthought, as is done in many organizations.

Qualitative and quantitative measures such as idea generation, idea diffusion, links between activities and impacts, and idea selection all present unique opportunities for organizations to consider how innovation can be grown. For instance, the personnel metric *amount of knowledge increased* is a highly qualitative measure that looks to gauge employees' knowledge growth in a particular area. The rationale behind this metric is that the innovation being done through experiments and learning opportunities from successes and failures all increase knowledge that enhances innovation.

25. Plato, M. California's resourcefulness pays off (with IT innovation). (July 17, 2014). Forbes Media, Jersey City, NJ. <http://www.forbes.com/sites/netapp/2014/07/17/california-resourceful-it/>.



# Recommendations for Developing IT Metrics

Based on our interviews, the report now sets forth a series of recommendations on the development of metrics for use by CIOs in measuring IT performance. The recommendations are organized into a process framework:

- Designing an IT metrics program
- Implementing an IT metrics program
- Evaluating an IT metrics program

## Designing an IT Metrics Program

### Recommendation 1: Set Clear Goals Before Selecting Metrics

A common misstep in metric use is deciding which metrics to use before clear goals and objectives have been identified and established. The CIO should look first at what the organization wants to accomplish and then decide on the appropriate metrics. If this is not done, the CIO will pick metrics that measure aspects of performance that are not critical to the organization's goals.

Having clear goals not only ensures the collection of the right kinds of data, but also ensures that the process is transparent and fair to all who are involved. This also helps everyone get on the same metrics page. One CIO explained how leadership attitudes affect the ability to aggregate data and locate performance levels across the organization, sharing that:

Some execs are like, "Oh, let's collect this data." But they don't have it well defined, they don't communicate across government what they're trying to achieve, and they don't share what the details should look like. So you get these wide disparities.

### Recommendation 2: Develop a Strategic IT Plan Linked to Agency Strategic Goals

CIOs should work quickly and diligently to create detailed, thorough strategic plans. A CIO should start with the agency's strategic plan to assess the areas where technology can enhance the agency's capacity and likelihood of reaching the goals. In addition to reviewing agency plans, a CIO also should speak directly to agency leadership to gather more information on the goals, strengths and weaknesses, threats, and importance of each goal (to help set priorities). Aligning IT strategy with the organization's goals helps everyone from the agency's leaders to frontline public employees understand how their personal performance can contribute to the organization's overall performance. The alignment of goals should create a road map for success.

Alignment between IT goals and agency goals does not happen magically or automatically. Efforts to engage agency leadership must occur in order to find success. The agency and the



IT department must reinforce each other with active involvement and communication on strategic plans. Thus, the presence of an aligned or unaligned strategic plan reveals the relationship between the IT department and organization officials.

In a 2015 report, GAO asserted that the Library of Congress had a significant alignment problem between the agency's goals and its IT infrastructure. The Library of Congress obligated \$119 million on IT in FY 2014. However, it does not have an IT strategic plan that aligns with the agency goals. This lack of a strategic plan also was indicative of several other IT weaknesses, such as poor investment management, information security, and service management, as well as a lack of IT leadership.<sup>26</sup>

After a CIO seeks alignment, the IT department should begin the process of establishing a baseline so that it is able to set realistic goals as well as benchmark along the way. The department also should inventory IT systems and applications to understand all assets so the CIO can make accurate projections about future needs. For example, understanding basic information such as the total number and age of the computers, and forecasting when new computers will need to be purchased will help with accurate strategic planning. Then, the CIO should develop and periodically reassess a timeline of activities that will help the IT department and agency reach their goals. This timeline should take into consideration the agency leadership's priorities, possible risks, budget projections, and metrics that can evaluate performance based on the baseline established. Finally, CIOs can remain engaged with other agency leaders by communicating their goals and ensuring that they are representing the department.

The study's author conducted a content analysis of state IT strategic plans to understand how and in what places organizations were using metrics. The results were disappointing because in many IT strategic plans there was limited, if any, attention given to metrics. Plans did not detail which metrics would be used to measure progress towards goals and objectives. The lack of metrics in these documents indicates that the level of care taken around metrics from a strategic perspective can be improved significantly. If the CIO has a strategic plan, the CIO should look at other cities', states', or agencies' plans to assess their level of detail and get ideas for improvement. Without a good strategic plan, chances are the CIO does not have high-quality performance metrics. The process of strategic planning should lead to the discovery of metrics that cover short-, medium-, and long-term horizons. It also should result in greater security measures and clearer outlooks on the future.

### **Recommendation 3: Engage Internal and External Stakeholders in the Development of Metrics**

Metrics require buy-in from two groups of stakeholders:

- Internal (IT department employees)
- External (everyone outside the IT department)

Stakeholders should be engaged in the selection, definition, and collection of metrics. Stakeholders need to personally buy into the metrics, and understand the value behind participating in metrics programs. Customer-specific metrics are important because working with clients early on allows CIOs to understand what the customer finds to be important and how it evaluates success.

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26. Strong leadership needed to address serious information technology management weaknesses. (GAO-15-315). (March 31, 2015). GAO, Washington, D.C. <http://www.gao.gov/products/GAO-15-315>.

Conversations on metrics are important to ensure metrics are relevant to the management of strategic IT projects. In the early days of scoping a major IT project or even redesigning an existing system, the client should be asked to describe how it would evaluate success (and failure) of the effort. The conversation on metrics helps the IT Department focus its attention on the issues that matter most to the client. Furthermore, these discussions highlight the unintended but welcome consequence of having the client prioritize its needs and outcomes. During these early conversations, a plan is put in place to collect data on the key metrics against which everyone will be able to benchmark future performance. The goal of these conversations is to get clients to clearly specify not only the overall metrics that they care about, but also to articulate the *process* through which the performance and success of the IT project, system modernization, etc., will be linked to agency outcomes. Capturing this process over time enables CIOs to see trends and patterns that enable the construction of maps that link IT performance to agency outcomes across a range of IT projects by types, systems, and client groups.

#### **Recommendation 4: Collect Baseline Data on Performance**

Collecting baseline data is important because it allows the CIO to accurately and reasonably measure performance. Baseline data are the foundation of performance management. A baseline methodology should be assessed carefully and agreed upon before beginning. Baseline data should be collected over a given period to capture the necessary variances from day-to-day events. The process of collecting the baseline data will help the IT department discover how to make the ongoing data collection processes more effective and efficient.

Without baseline data, entire performance management programs can be ineffective, inaccurate, and actually harmful to the organization. For instance, in an audit of the U.S. Securities and Exchange Commission (SEC), GAO found weaknesses in configuration baseline standards in the information security controls because the agency did not monitor or maintain its baselines properly.<sup>27</sup> The weaknesses could potentially jeopardize the reliability of the data processed by other financial systems as well as increase other risks.

#### **Recommendation 5: Avoid “Watermelon” Metrics**

While CIOs are developing metrics, they should avoid creating index measures that combine multiple metrics, which can become “watermelon” metrics. Watermelon metrics are what one interviewee and his department use to describe results that appear “green” (reflecting success) on the outside but reveal a “red” (reflecting failure) core when split apart. If metrics aren’t carefully designed, they can lull unsuspecting IT departments into a false sense of security.

CIOs spoke of remaining skeptical about any metrics results until their confidence was rightfully earned, and often it was earned by redesigning the metrics entirely. For example, upon one CIO’s arrival to the IT department, the CIO became suspicious of some infrastructure measures despite what appeared to be strong uptime metrics. The CIO had the IT team redesign a metric to capture the percentage of end-to-end availability performance—a result that shocked the team. He recalled:

It was eye opening for the infrastructure team. They had more problems than they realized because they weren’t measuring it.... What IT people like to do is reboot the server and move on. That’s not the root cause. That doesn’t define the root cause. Why did that problem happen, and how can we prevent it in the future?

27. Financial audit: Securities and Exchange Commission’s fiscal years 2014 and 2013 financial statements. (GAO-15-166R). (November 17, 2014). GAO, Washington, D.C. <http://www.gao.gov/products/GAO-15-166R>.

To avoid watermelon metrics, CIOs must constantly test and optimize the metrics.

### **Recommendation 6: Select Fewer and Less-Complex Metrics**

The old adage of “less is more” can be applied to metrics in the public sector. Quantity does not necessarily equal quality, and CIOs must understand this to find true value from their metrics. Fewer, more meaningful metrics can be more effective than a vast laundry list of metrics. The portfolio of metrics chosen should be done by identifying improvements that should be made and by engaging stakeholders. A metrics portfolio should consist of metrics that are linked to the organization’s mission and geared toward better management. One CIO noted:

The quantity of metrics itself does not deliver value, so pick the metrics that really mean something to you and your customer, and just focus on those.

Metrics should spur action such as improving performance or coaching staff. With too many metrics, CIOs can become focused on reporting metrics instead of taking action on the most important outputs. Careful strategic planning can help with establishing needed metrics.

Additionally, metrics that are too granular, repetitive, difficult to explain, and hard to conceptualize are not necessary for adequate performance management. Metrics do not have to be complex to be useful. Further, the use of complex metrics can be a guise for vanity metrics. These are metrics that are in place, not because they provide value to the organization, but because they look good or give an impression of success or validate an expense.

A good method of preventing the use of overly complex or vanity metrics is for the CIO to know the goals and objectives first and keep iterating until the department arrives at metrics that offer quality information and help drive decision making. Another way to prevent complex metrics from entering the portfolio is to seek usefulness. One CIO noted:

If a metric is not informing decisions and enhancing government, we push it aside. For us, usefulness is everything.

Usefulness is the name of the game, and CIOs should actively seek meaningful metrics rather than popular or high volumes of metrics.

### **Recommendation 7: Design and Build Dashboards that Capture Metrics**

Metrics do not matter if we cannot make good use of the data they produce. In the past, CIOs and others were buried in spreadsheets and reports that would take inordinate amounts of time to decipher in order to come to a conclusion. Dashboards help us use data in a way that is easy to visualize and manipulate to meet our needs. The proliferation of open data programs and an overall trend in government to become more transparent has meant that many agencies are moving toward building dashboards to serve their internal needs as well as to offer citizens an opportunity to view government performance.

IT departments at all levels of government have been building dashboards; however, they are largely building dashboards for other departments and not for themselves. Throughout this study, CIOs exhibited Cobbler’s Children Syndrome, named after the very busy shoemaker whose own children didn’t have shoes. A focus on building IT dashboards will help IT departments visualize their performance as well as communicate more about their value. Doing so will also help CIOs engage better with their stakeholders and find more value in their efforts.

### **Recommendation 8: Do Not Focus Exclusively on IT Infrastructure Metrics**

CIOs largely reported using technical infrastructure metrics such as server uptime/downtime and the number of help desk tickets resolved. These types of metrics are captured because they are important and because they are the easiest to collect. These metrics are automated and easily fit within current business processes; however, these types of metrics provide little value to stakeholders.

CIOs need to have a balanced portfolio that looks at metrics around people, projects, and even innovation. Attention to aspects of performance that are more difficult to develop and evaluate such as process improvement, key initiatives, and innovation might take additional time, but are worth the extra effort. Having a portfolio of metrics that covers an array of organizational functions only improves the health of the organization. A diverse metrics portfolio allows for information to be reinforced, innovation to come to the fore, and trends to reveal themselves. With a diverse portfolio, CIOs truly are able to make evidence-based decisions.

While CIOs often had one primary focus (traditionally on internal IT), their focus shifted as stakeholder relationships and organizational priorities changed. Intuitively, this makes sense; as one part of the operation improves, other foci come to the fore and enable CIOs to place attention elsewhere. CIOs should explore the deployment of noninfrastructure metrics as a sign that eventually things will change in their organization and they will have other opportunities to communicate their value and effectiveness.

## **Implementing an IT Metrics Program**

### **Recommendation 9: Communicate Regularly and Often with Key Stakeholders About Metrics**

We know that IT is an enabler for many innumerable organizational functions. However, communicating the value of IT can be difficult for many CIOs. This is difficult because metrics often are measuring performance, not value. Assessing value can mean monetary data, nonmonetary data, process efficiency, growth, and customer satisfaction, and these values can be assessed differently by each stakeholder. Keeping in constant contact and communication with key stakeholders about metrics allows for building advocates and awareness of the value of IT within an agency. Maintaining dialogue with stakeholders allows the CIO to develop and reassess metrics that are up-to-date, useful, and goal-oriented. This can be done by establishing regular meetings with stakeholders that ensure changes or possible disruptions do not go unnoticed.

As an IT project gets under way, the client is kept informed about the progress and data is collected on the project. Data is mostly gathered through regular meetings, where questions are posed, such as what is working well and what is not, as well as how much disruption is being caused by the project and what can be done to lower this effect. This is an important aspect of building advocates and evangelists for the value of IT within the agency. Conversations such as these enable the clients to discuss and highlight the value of IT in the context that makes the most sense to them—their own business operations and the realization of their goals and objectives. Metrics are captured and reported on a regular basis so that everyone impacted by the project, both directly and indirectly, has situational awareness on the current progress with the project and the next key milestones.

### **Recommendation 10: Keep Metrics Updated**

CIOs emphasized the need to keep up-to-date and timely metrics. If the CIO has a metric, then ensure that the IT department is capturing data on it, analyzing it, and reporting the current status of it. The CIO should not have metrics that are outdated. Some CIOs recognized

themselves implementing the ill-advised practice of having metrics that they rarely use or keep updated. A CIO noted that doing this can place CIOs in an “awfully reactive position” because they are not staying alert to what is happening and what is needed, which can lead to the proliferation of unintended consequences. The strengths, weaknesses, and threats to an agency are changing regularly. Without up-to-date metrics, there are vast opportunities for an IT operation to be placed at risk due to inaccurate or unmanaged information.

### **Recommendation 11: Use Metrics to Set Targets**

A critical function of metrics is to establish targets that focus the attention of internal and external stakeholders. CIOs can use metrics to establish targets within each of the categories discussed earlier (project management, operations management, and innovation). Ideally, targets should account for several considerations. First, targets should be established across a given time horizon, such as three- to five-year time periods. This enables one to plan to meet both the near-term and long-term objective. Second, targets need to be not only realistic but audacious. The value of setting targets is in stretching organizations beyond current capabilities and performance to reach higher standards of excellence. Boldness in target setting will promote a greater level of innovation, as continuing to invest in and execute current processes will not be sufficient.

Finally, it is important to reward the achievement of targets. After all, to achieve bold targets employees will have to take risks, design new processes and systems, and test novel methods of client engagement. These efforts are seldom easy, as they require change and must be recognized. However, as the next recommendation notes, beware of people gaming the metrics.

### **Recommendation 12: Keep an Eye Out for People Gaming the Metrics**

Metrics are only as good as their utilization, so managers must make sure that they are used as intended. There is ample evidence of the negative outcomes that can happen when employees attempt to game the system and work toward a certain metric output instead of working to actually improve performance. When this is done, it does not benefit the organization and will, in turn, have negative effects on future efforts.

Metrics reflect on the performance of individuals and are critical to success, but metrics can dominate management practices in a negative way. When leaders forget that they are managing people and not numbers, they tend to set rigid targets whose outputs do not consider variables such as new conditions, departmental changes, understaffing, or the many other situations that employees experience in the course of doing their jobs. If employees are faced with such rigid metrics while knowing that—if metrics reflect poor performance—they will be penalized, then the organization is not going to be as effective as it could be.

## **Evaluating an IT Metrics Program**

### **Recommendation 13: Revise Metrics Periodically**

In the interviews, we were told by several CIOs that, in order to get the right metrics, one must continually reassess. This requires CIOs to take a critical look at what they’re measuring, things that have changed, possible threats, and opportunities. Additionally, current metrics should pave the way for new metrics. A CIO stated:

It’s never right the first time. There is always a next intelligent question coming. If there is another question, we have the capability to answer. Once you get the information, more will come.... The point of

these things is to adjust and learn and see these things systemically. Inexperienced technology professionals are still learning that.

Finding the right metric means that, more than likely, a CIO has tried several and found a few that truly offer quality information about a given process. Another CIO said:

Developing metrics is a unique skill that takes time to grow and develop.... We redevelop and reorganize metrics based on their usefulness; this re-evaluation process is always in play.

#### **Recommendation 14: Seek Continued Renewal and Improvement**

Metric optimization must take place to enhance performance management. Optimization is continuous renewal and improvement; specifically, it requires organizations to mine metrics and use the information to drive continuous improvement. In short, organizations must constantly try new metrics and test their impact to make them as useful as possible. As organizations continue to revise their metrics, they will grow to understand the strengths and weaknesses of their program and become more intelligent and agile in their decision making. In addition to metric optimization, CIOs must communicate the changes that they make to their metrics, thus consistently developing, implementing, and reassessing their metrics in concert with their various stakeholders.

# Appendix I: Research Methodology

The author reviewed the literature across diverse fields such as management sciences, information systems, public administration and management, and operations management to examine the state-of-the-art use of metrics in the public sector. Specifically, he looked for studies that reported on the public sector's experience with building a culture of performance management, implementing metrics programs, and embedding evidence-based decision making. The project scope was not restricted to studies that only focused on IT metrics. The literature pointed to a critical issue: There was a big gap between what was “espoused” in writings versus the “reality” of what he had heard from CIOs during previous research engagements. Given this finding, the project took two simultaneous pathways to explore the research problems.

First, the project analyzed strategic plans from federal and state government IT departments to understand how metrics were captured in these formal plans. The author examined strategic plans because they encapsulate the process through which an organization establishes its long-term objectives and the goals to meet those objectives. Understanding how organizations deliberately situate IT metrics within their broader strategic plans offers insights into how they value metrics and their use within their organization. After scouring over 1,000 pages of federal and state IT strategic plans, the author found limited coverage of metrics. This was unexpected. When metrics were described, they were focused primarily on issues of management of IT infrastructure and did not delve into details when it came to metrics for IT innovation, IT personnel, and the management of IT projects, all of which are equally, if not more, important when it comes to the IT function within agencies.

Second, the project created a semi-structured interview protocol on metrics. The author interviewed 27 CIOs or IT directors across three levels of government— federal, state, and local. Each interview lasted about an hour. Two researchers participated in the interviews; one conducted the interview while the other took notes. Also, all except three interviews were recorded. After each interview, individual cases were written, notes were compared, and themes were identified and verified. The author stopped interviewing when the researchers reached theoretical saturation and no new information was being gleaned from two successive interviews. The author shared the draft report with CIOs who were not a part of the original sample. These CIOs reviewed the material and confirmed our findings based on their professional experience using metrics.



## Appendix II: Federal Data Center Consolidation Initiative (Core Data Center Metrics and Targets)

Metric	Metric Category	Description	Target Value (to be achieved by the end of FY 2015)
Power usage effectiveness	Energy	The amount of total power consumed at a facility divided by the total amount of IT power consumed	1.5 or lower
Cost per operating system per hour	Cost per operating system	The total costs of a data center divided by the number of operating systems, figured for an hourly cost basis	Not yet established
Full-time equivalent ratio	Labor	The total number of servers divided by the total number of data center personnel (government and contract employees)	At least 25 servers per full-time equivalent
Facility utilization	Facility	The total number of server racks multiplied by 30 square feet and then divided by the total square feet reported in the data center	At least 80 percent
Storage utilization	Storage	The total storage used divided by the total storage available	75 percent for in-house storage utilization and/or 80 percent for cloud computing/outsourced facilities
Core to non-core physical server ratio	Facility	The number of physical servers in core data centers vs. the number of physical servers in non-core data centers	At least 65 percent
Core to non-core operating system ratio	Virtualization	The number of operating systems in core data centers vs. the number of operating systems in non-core data centers	At least 65 percent
Virtualized operating systems	Virtualization	The number of virtualized operating systems divided by the total number of operating systems	75 percent of operating systems virtualized
Virtualization density	Virtualization	The number of virtual operating systems per virtual host	10 operating systems per virtual host
Virtual hosts	Virtualization	The number of virtualized hosts divided by the total number of servers	At least 20 percent
Virtualization optimization percent	Virtualization	Average of the preceding three metrics: virtualized operating systems, virtualization density, and virtual hosts	Not applicable—average of the three metrics above

**Source:** GAO analysis of OMB and Task Force data. GAO-14-713<sup>28</sup>

28. Reporting can be improved to reflect substantial planned savings. (No. GAO-14-713). (September 2014). GAO, Washington, D.C. <http://www.gao.gov/products/GAO-14-713>.



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## About the Author

**Kevin C. Desouza** serves as the associate dean for research at the College of Public Service & Community Solutions and is an ASU Foundation professor in the School of Public Affairs at Arizona State University (ASU). He is also a Nonresident Senior Fellow at the Brookings Institution. At ASU, he is a senior research fellow with the Center for Organization Research and Design and is an affiliate faculty member of the Center for Science, Technology & Environmental Policy Studies.



Immediately prior to joining ASU, he directed the Metropolitan Institute in the College of Architecture and Urban Studies and served as an associate professor at the Center for Public Administration and Policy within the School of Public and International Affairs at Virginia Tech. From 2005 to 2011, he was on the faculty of the University of Washington (UW) Information School and held adjunct appointments in UW's College of Engineering and at the Daniel J. Evans School of Public Affairs. At UW, he co-founded and directed the Institute for Innovation in Information Management (I3M); founded the Institute for National Security Education and Research, an interdisciplinary, university-wide initiative, in August 2006 and served as its director until February 2008; and was an affiliate faculty member of the Center for American Politics and Public Policy.

Desouza has authored, co-authored, and/or edited nine books and has published more than 125 articles in prestigious practitioner and academic journals. Desouza's work spans multiple disciplines and his publications have appeared in leading information systems, management, public administration, innovation, technology management, and software engineering journals. His most recent book is *Intrapreneurship: Managing Ideas Within Your Organization* (University of Toronto Press, 2011). His work also has been featured in a number of publications such as *Sloan Management Review*, *Harvard Business Review*, *Businessweek*, *Washington Internet Daily*, *Computerworld*, *KM Review*, *Government Health IT*, and *Human Resource Management International Digest*. Desouza is the author of two reports for the IBM Center for The Business of Government, *Challenge.gov: Using Competitions and Awards to Spur Innovation* and *Realizing the Promise of Big Data*.

Desouza has advised, briefed, and/or consulted for major international corporations, nongovernmental organizations, and public agencies on strategic management issues ranging from management of information systems to knowledge management, competitive intelligence, and crisis management. He also has advised budding entrepreneurs launching new initiatives and organizations. Desouza's current research includes strategic management of information systems in the public sector, innovation within public agencies and multi-sectoral networks, design of smart cities, and information and knowledge-sharing networks.

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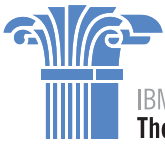
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