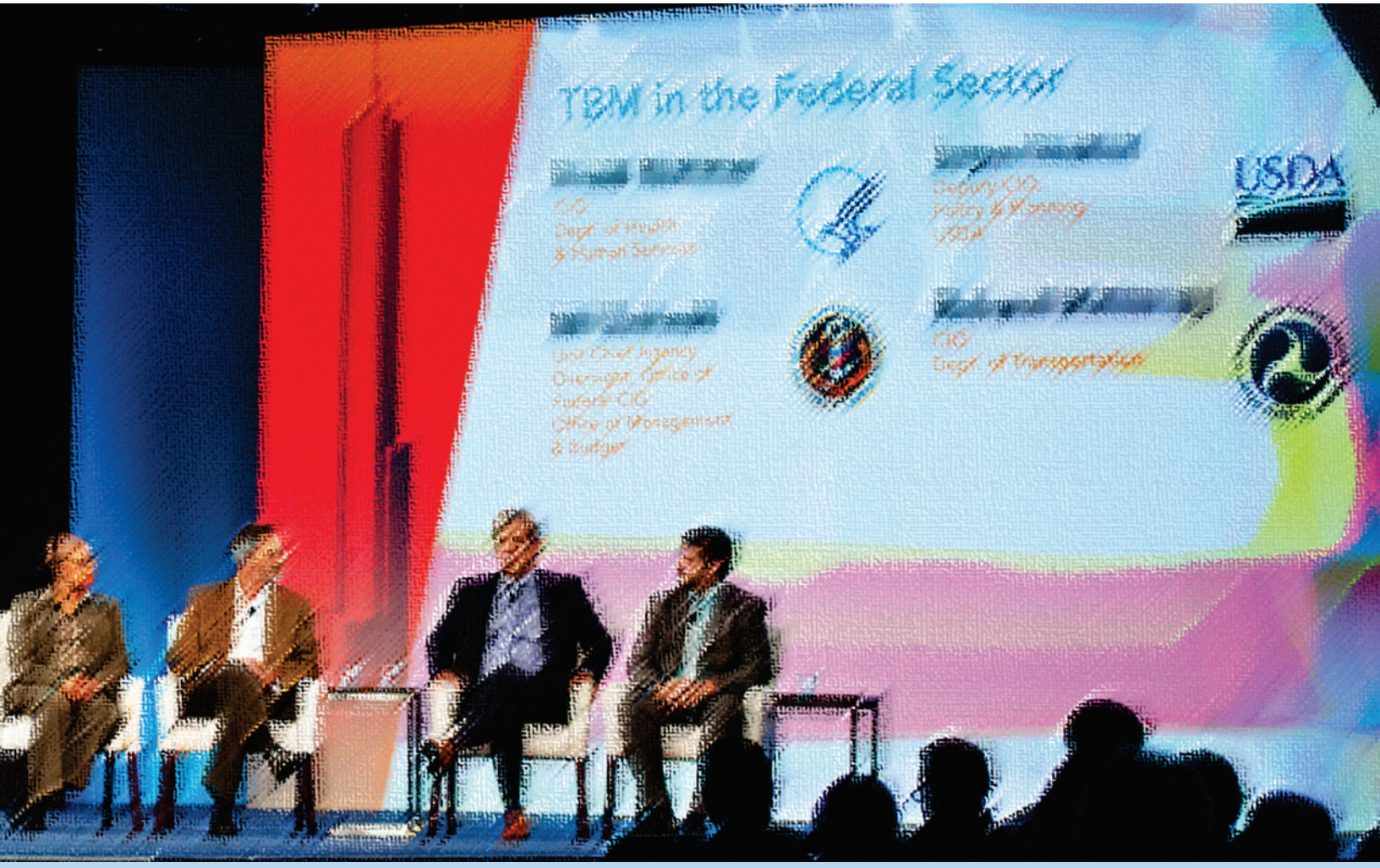
TBM COUNCIL

Accelerating the Mission:

Recommendations for Optimizing Federal Technology Cost and Value in the Age of FITARA



A Report from the Federal Commission on
IT Cost, Opportunity, Strategy, and Transparency

What Private Sector IT Leaders Are Saying About Technology Business Management

" Technology Business Management — or TBM — helps companies across industries realize their full potential. The advent of digital, the Internet of Things and mainstream cloud are bringing new innovative capabilities to the forefront. TBM brings the business translation to these technological advances so you and your people can quickly decide on tradeoffs and new investments to improve competitiveness, customer engagement and the bottom line."

— Mike Brady, Global CTO, AIG

" IT has shifted from being an order taker to an originator of ideas to win in the marketplace. A new partnership between IT and business is crucial to drive innovation. Technology Business Management (TBM) — a framework that provides IT cost transparency, benchmarks, operational trends — enables a different conversation."

— Mike Brown, VP, IT, ExxonMobil

"Forget big data, social, mobile, and cloud. The real change in the past decade is that technology is no longer a business enabler; it *IS* the business. When your business is on the line and your function is front and center, you need a method and system born in technology and designed for technology leaders. TBM is that method and system."

— Ralph Loura, Global CTO, Rodan + Fields

" Every CIO and finance leader is challenged to ensure their budget and resources are driving efficiency and creating value for the business. Increasingly, the oversight of those resources and governance of IT is both within and outside the traditional IT structure. TBM helps connect the supply and demand of IT, making transparent the consumption of IT."

— Jim DuBois, Corporate CIO, Microsoft Corporation

Contents

Foreword

As a provider of services to the federal government, the General Services Administration (GSA) is responsible for showing value for agency spending. Our agency priorities include delivering better value and savings for our customer agencies, making a more sustainable government, and leading with innovation. Each of these factors has implications for the way we acquire, develop, and run IT.

Reflecting authorities granted through the Federal IT Acquisition Reform Act (FITARA) and its predecessors, my organization has consolidated IT management under the CIO and centralized our IT spending. This work began in 2012 and has helped us gain visibility into GSA-wide IT spending and investments. From fiscal years 2013 to 2015, we reduced our budget by 17 percent, while maintaining the health of our IT investments. Steps like consolidating data centers (net savings: $17 million) and eliminating duplicative technologies and contracts helped us reduce spending without sacrificing service quality or adding risk.

These steps depended largely on having agency-wide transparency of IT spending. However, our reliance on financial management through spreadsheets has constituted a heavy lift to find, collect, and analyze data on costs, assets, people, and other resources.

Beginning in early FY2016, we began implementing a standard taxonomy, cost model, and set of business metrics through a methodology called Technology Business Management — or TBM — that allows us to automate the transparency we need to make decisions. TBM is beginning to give us the ability to connect our IT spending to the outcomes they serve while providing the insights we need to make data-driven tradeoffs between cost, quality, and value.

This report echoes many of the approaches we have taken at GSA. I encourage Federal IT practitioners to read this report and carefully consider its recommendations.

David Shive
Chief Information Officer
General Services Administration

Commission Participants

The TBM Council thank the following sponsors and professionals who dedicated their time, energy, and knowledge to the work that culminated in this report.

Commission Leaders

Jim Thompson

Ed Hayman

Doug Lane

Kathleen Flynn

Dain Belyeu

Brian Wissinger

Mitchell Bostelman

Kevin Corcoran

Paul Schmidt

Alex-Paul Manders

Ralph Kahn

Hope Jones

TBM COUNCIL

Chris Pick

Todd Tucker

Commission Program Manager:
Suzanne Chartol, TBM Council

Lead Agency CIO Participants

Frank Baitman, Department of Health & Human Services

Sylvia Burns, Department of Interior

Steve Cooper, Department of Commerce

Joyce Hunter, Department of Agriculture

Richard McKinney, Department of Transportation

David Shive, General Services Administration

Other Federal Participants

Department of Agriculture

- Jack Blount
- Mike Clanton
- Solongo Erdenekhuyag
- Antoinetta Grant
- Tonye Gross
- Naomi Gumbs
- Jon Holladay
- Dr. Claudette Millsap
- Kai Moericke
- Todd Schroeder
- Richard Young (CIO, Foreign Agriculture Service)

Department of Commerce

- Gordon Keller

Department of Defense

- Kevin Garrison

Department of Health & Human Services

- Beth Anne Killoran (CIO)
- Brock Stevenson

Department of Homeland Security

- Angela Cobb
- Joseph Klimavicz (CIO)
- Luke McCormack (CIO)
- John Raymond

Department of Housing and Urban Development

- Janice Ausby
- Rafael Diaz (CIO)
- Cynthia Moore

Department of the Interior

- Oluwarotimi Abimbola
- Bruce Downs
- Amanda Epperson
- Kevin Schmitt

Department of Justice

- Richard Chandler

Department of Transportation

- Kristen Baldwin
- Jason Gray
- Walter McDonald
- Maria Roat

Department of the Treasury

- Sonny Bhagowalia (CIO)

Department of Veterans Affairs

- Jarvis Newsome

Environmental Protection Agency

- Harrell Watkins

Federal Trade Commission

- Megan Baburek

General Services Administration

- Trey Bradley
- Lesley Briante
- Gail Bruss
- Liz DelNegro
- Brian Isbrandt
- Craig Jennings
- Peter Lenetine
- Jason Mason
- Stacy Riggs

NASA

- Leigh Anne Giraldi

National Institutes of Health

- Taryn Cyrus

Navy

- Robert Foster

Nuclear Regulatory Commission

- Nicholas Buggs
- Daniel Shapiro
- Menelik Yimam

Office of Management and Budget

- Russell Ficken
- Adam Hughes
- Kelly Morrison
- Mishu Rahman
- Ben Sweezy
- Randy Tharp

U.S. Senate

- Tim McCrosson
- Harrison Moore (Finance Committee)

Private-Sector Participants and Presenters

- Kevin Brown, Freddie Mac
- Michael Cockrill, State of Washington
- Michael DeAngelo, State of Washington
- Larry Godec, First American
- James LaPlaine, AOL
- Kim Manigault, KeyBank
- Chuck Niethold, First American
- Stacey Shifflett, Freddie Mac

About the TBM Council

The Technology Business Management (TBM) Council is a nonprofit business entity focused on developing a definitive framework for managing the business of IT. The Council is governed by an independent board of business technology leaders from a diverse group of the world's most innovative companies. The Council has established a set of tools and best practices including organizational traits, management disciplines, a common taxonomy, and metrics. Members collaborate with their peers through an annual global conference, regional meetings, and an online community.

The TBM Council's board members are:

Brian Adams
Former CIO
WorleyParsons

Debra Bailey
CIO
Nationwide Building Society

Mike Brady
Global CTO
AIG

Mike Brown
VP, IT
ExxonMobil

Anil Cheriyan
EVP & CIO
SunTrust Banks

John Bruno
CIO
Aon

Jim DuBois
CIO
Microsoft

Larry Godec
SVP & CIO
First American Financial

Sunny Gupta
CEO
Apptio

Guillermo Diaz
SVP & CIO, IT
Cisco

James LaPlaine
CIO
AOL

Ralph Loura
Global CTO
Rodan + Fields

Greg Morrison
SVP & CIO
Cox Enterprises

Tom Murphy
University CIO and VP, IT
University of Pennsylvania

Michael Neff
CIO
RWE

Jim Scholefield
Global CIO
Nike

Phuong Tram
CIO
DuPont

George Westerman*
Research Scientist
MIT Initiative on the Digital Economy

* Academic Advisor

To learn more about the TBM Council or become a member,
please go to www.TBMCouncil.org.

Executive Summary

The U.S. federal government increasingly relies on digital technologies to execute missions and serve constituents, while facing downward pressure on technology budgets and resources. Agency CIOs have a unique opportunity, via the Federal IT Acquisition Reform Act, to exercise greater control over federal IT spending to improve efficiency and accelerate technology-related programs. As agency CIOs have testified, greater control depends on better transparency.

The Commission on IT Cost, Opportunity, Strategy, and Transparency (IT COST) — a joint effort by agency CIOs and private-sector experts and partners — was founded to tackle this challenge. By evaluating best practices known collectively as Technology Business Management (TBM), the Commission developed recommendations for federal CIOs and stakeholders to improve transparency, optimize IT spending and resource consumption, and accelerate critical initiatives such as public cloud adoption, the implementation of shared services and data center consolidation.

This report shares 21 recommendations for agency CIOs and federal leaders. These include:

- **Adopting a standard taxonomy, model and management system for IT costs, resources, and services** so that IT leaders, CFOs and other stakeholders use the same language and methodology to evaluate and improve cost for performance
- **Employing a standard set of TBM metrics** for evaluating and managing cost-effectiveness and for benchmarking IT costs and performance on an annual basis
- **Establishing an office within each agency or department**, with the right people and skills, for creating transparency and governing cost-efficiency over time
- **Setting up a government-wide governance board** to facilitate the adoption of TBM practices throughout the federal government

In this report, readers will also find the standard taxonomy and metrics recommended by the Commission. Given the importance of IT in satisfying the missions of the federal government — and improving the lives of all Americans — the Commission strongly advises federal CIOs and technology leaders to use these recommendations and tools to improve the value that taxpayers receive from federal IT spending.

Improving Taxpayer Value from Federal IT Spending

With the Clinger-Cohen Act of 1996, the federal government made a concerted effort to rein in and better manage its technology spending while reducing the risk and failures of major IT investments. Clinger-Cohen paved the way for a key piece of legislation in 2014 that breathed new life into the efforts to control spending: The Federal IT Acquisition Reform Act (FITARA).

FITARA creates requirements for improving the acquisition and operation of IT assets. These include authority enhancements for department-level CIOs, enhanced transparency and risk management of IT investments, regular reviews of IT portfolios, and a renewed emphasis on federal data center consolidation and strategic sourcing. FITARA not only seeks to succeed where Clinger-Cohen failed, it exploits the fact that when CIOs are more engaged in IT investments throughout their agencies, those investments tend to be more successful.

IT in the Federal Government

- Over 10,500 data centers
- $81.6 billion budget for FY2017 in known annual IT spending
- $55.9 billion of the FY2017 federal IT budget devoted to Operations & Maintenance (O&M) vs. $18.7 billion for Development, Modernization, and Enhancements (DME)
- 25.9% of major IT investments are medium or high risk

Source: ITDashboard.gov

Congress enacted FITARA to reduce waste and duplication in the acquisition and management of federal information technologies. In doing so, FITARA seeks to enhance taxpayer value. As such, the act represents a potential turning point for federal IT departments and the agencies who depend on them. However, taken alone, FITARA is not enough.

A major impediment to taxpayer value remains: higher spending on running the business of government stands in the way of federal programs that depend on new or modernized IT systems. According to the Government Accountability Office (GAO), the federal government spent more than 75 percent of its total IT budget on operations and maintenance (O&M) in fiscal year 2015. This O&M spending has increased over the past seven years, *resulting in a $7.3 billion decline in development, modernization, and enhancement (DME) spending over that same period*. In other words, O&M, or the government's run-the-business spending, is crowding out its change-the-business spending.

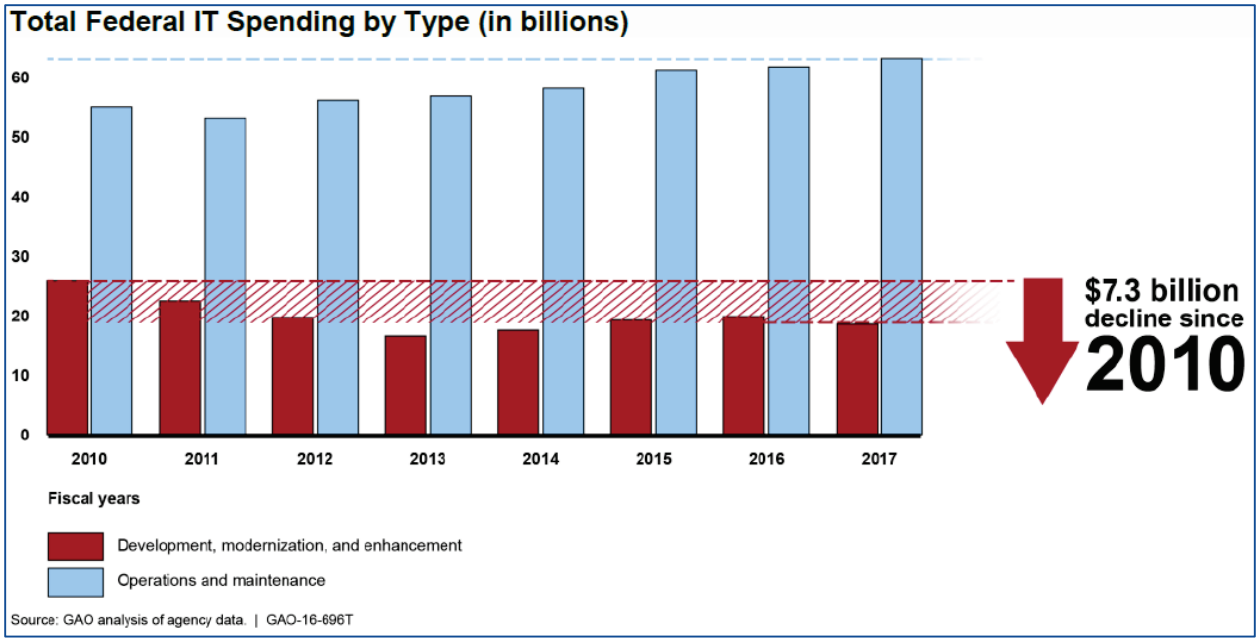


Figure 1: Increasing O&M spending by federal agencies has crowded out DME investments by $7.3 billion since 2010

The challenge represented by continuously increasing O&M spending is not unique to the public sector. Indeed, private sector CIOs, CFOs, and CEOs have been tackling this problem for years, providing valuable lessons for federal leaders. Of those lessons, none is more salient than the need for better transparency.

Shifting Money from Run to Change

"These decisions are not just good for IT; they are good for the business. They are instrumental in our ability to shift spending from run-the-business to change-the-business investments, in turn helping us execute on our business strategy. My goal is to reduce the cost of running IT services 5 to 10 percent per year on a sustainable basis — funds that Cisco can choose to deploy to strategically change the business."

— Rebecca Jacoby, Chief Operating Officer, Cisco

Source: Tucker, Todd. *Technology Business Management: The Four Value Conversations CIOs Must Have With Their Businesses.* Bellevue, WA: Technology Business Management Council, 2016. 226. Print.

FITARA's Power Depends on Better Transparency

FITARA grants department-level CIOs greater authority over IT resources employed by their agencies, not just those managed directly by their IT departments. Experience in the private sector, where CIOs have had broad authority for acquisition, development, and operation, shows that authority is not enough. Agency CIOs must be able to manage and demonstrate value for the money spent on what they deliver.

In their book *The Real Business of IT*, Richard Hunter and George Westerman show that transparency is an essential force for demonstrating value for the money spent on IT. By being clear about cost and performance, CIOs can take charge of the value conversation. They can show their capabilities as IT leaders, help business leaders to improve their processes, and then take on new strategic roles.[1]

But transparency is about more than credibility. According to Hunter and Westerman, "When the CIO successfully communicates value for money, the enterprise knows it is getting a competitive price for the right balance of quality…and performance. It also knows that the way to reduce IT cost is not simply to cut the IT budget but rather to adjust quality or consumption of IT services where excess quality or consumption doesn't improve business performance."

Agency CIOs tend to agree with the need for better transparency. Department of Transportation CIO Richard McKinney asks, "How do we begin to use the three foundational authorities of FITARA, namely HR, budget, and acquisition approval that you have wisely laid out in this legislation? I'm sure that we can all agree that in order to chart a course to where you want to go, you must begin by understanding where you are. I have been frustrated by the lack of good data, both technical and financial, that we have to measure our IT spend and performance."[2]

"I know how we assemble the IT portfolio for the government — it's a very imperfect process where a lot of the numbers are self-reported," said Department of Interior CIO Sylvia Burns. "In terms of having fidelity around the true value of the portfolio and where the organization wants to make tradeoffs or make certain decisions, it's very hard to use the portfolio for business decisions because the accuracy of the data is suspect."[3]

Transparency provides many benefits for a business. Cost transparency helps IT leaders optimize cost and business demand.[4] Operational transparency, or revealing one's operating processes to customers, can lead to improved customer satisfaction and speed of service.[5] While not without shortcomings, transparency is a powerful tool for applying the economic forces of supply and demand to IT.

---

1 Hunter, Richard, and George Westerman. *The Real Business of IT: How CIOs Create and Communicate Business Value*. Boston, MA: Harvard Business, 2009. 12. Print.

2 *Hearing before the House Subcommittee on Information Technology, Subcommittee on Government Operations, November 4, 2015.*

3 Boyd, Aaron. "Feds, Industry Work to Improve Reporting on IT Spending." Federal Times. N.p., 20 May 2015.

4 A 2014 McKinsey & Company study revealed that cost transparency improved existing infrastructure efficiency by 15 to 20 percent over three years, with an immediate 10 to 15 percent improvement for new investments. (Source: Agarwal, Himanshu, Leandro Santos, and Irina Starikova. "Managing the Demand for IT Infrastructure." *McKinsey & Company*, Apr. 2014. Web. 17 Dec. 2015.)

5 Buell, Ryan W. and Kim, Tami and Tsay, Chia-Jung. "Creating Reciprocal Value Through Operational Transparency." (May 20, 2015). *Harvard Business School Technology & Operations Mgt. Unit Working Paper No. 14-115*. Available at SSRN: http://ssrn.com/abstract=2449029

Transparency in IT is not a vague standard to which many IT leaders aspire. It is the very act of empowering IT leaders and their stakeholders to make decisions with data. To make data useful, it needs to be relevant and actionable for decision makers. The problem with many data-driven reports about IT cost, performance, and value — in both the private and public sectors — is they obscure the relevant facts for decision makers rather than illuminate them.

Take, for example, the cost of IT. Many federal reports break down IT costs by program and by projects, with the major emphasis on new investments and their total costs. The costs to deliver services on an ongoing basis in the context of the value provided (e.g., mission objectives supported, civilians served) remain elusive. Furthermore, the lack of common terminology, cross-agency reporting, and per-unit measures hinders cost comparisons for commodity IT services across the federal government.

This is analogous to a carmaker that reports on how much it spends on steel, labor, components, and other inputs, and also discloses investments in new equipment, but fails to cost the cars it sells. As a result, those who benefit from the products — i.e., the car *buyers* — cannot compare cost (price) to value.

By limiting transparency to program investments, there is little emphasis on driving continuously greater value from the the 75% of spending on O&M. It is no longer sufficient to report program and project costs alone; federal IT leaders and their constituents need better measures for comparing cost to value for all spending, O&M included. And they need them across all departments and agencies.

Federal technology leaders need the ability to generate accurate, reliable, and benchmarkable IT cost data that is consistent across the federal government. Without referenceable data based on a common taxonomy, any efforts to overhaul how the government buys and consumes technology will be frustrated. Furthermore, without giving agency CIOs better tools to evaluate all IT spending, the enhanced authority they have been given will represent a missed opportunity to improve value.

Changing the Dialogue with Transparency

"Complete transparency is the goal, including the data behind the metrics, so that folks have no question whether these costs are made up based on arbitrary rules. [This] helps us tie dollars to decisions. One month we say if we do this, that cost will go up, or it will go down. When we revisit that decision we can look at the data to see, was our analysis right? As they see not just costs but services we provide, what drives their cost, and that their decisions and consumption actually impact the cost structure, it builds these secure, safe places to have all kinds of dialogues and move the transformation agenda forward."

— James LaPlaine, CIO, AOL

Source: Tucker, Todd. *Technology Business Management: The Four Value Conversations CIOs Must Have With Their Businesses.* Bellevue, WA: Technology Business Management Council, 2016. 218. Print.

The Federal IT COST Commission Tackles Federal IT Transparency

Led by the Technology Business Management (TBM) Council, the Commission on IT Cost, Opportunity, Strategy, and Transparency (IT COST) represents a joint effort by agency CIOs, TBM experts, and private-sector partners to learn from and leverage private- and public-sector best practices for IT transparency, especially those aimed at better governing run-the-business spending. The goal of the IT COST Commission is to provide federal IT executives with a standardized approach for managing their comprehensive technology spend in a way that generates the most value for the American people while simultaneously eliminating waste and inefficiency.

The IT COST Commission produced this report in order to share key recommendations for applying TBM best practices in the federal sector. The recommendations are designed to help agency CIOs:

- Simultaneously reduce waste and increase the efficiency and efficacy of public-sector IT spending
- Use data-driven tools to demonstrate the cost, quality, and value of federal IT spending
- Accelerate the implementation of the Federal IT Acquisition Reform Act (FITARA)

To achieve the goal and define the necessary recommendations, the Commission brought together agency CIOs, representatives from the Office of Management and Budget (OMB) and the Technology Business Management Council, as well as advisors from industry-leading advisory firms and solution providers including Capgemini, Deloitte, ISG, Cask, and Apptio.

The Commission conducted regular meetings between June 2015 and March 2016 to devise and draft recommendations for the implementation of TBM best practices by the federal government. For a complete list of meeting participants, including the private sector presenters, please refer to the list on page iv. Additional meetings were held beyond the regular meetings to provide time to collaborate on additional details and perform the needed analysis. To read more about the Commission's approach, refer to Appendix C.

Importance of the Commission

"On the heels of the recently distributed draft recommendations for FITARA implementation, my Federal CIO counterparts and I are eager to support the work being done by the TBM Council. We believe that the IT COST Commission can give the taxpayers a better return on their investment while simultaneously providing Congress and the Administration with better insight into the value provided by technology. It's a win-win."

— Richard McKinney, CIO, U.S. Department of Transportation

Source: Technology Business Management Council. *Public And Private Sector Technology Leaders Join Forces In Pursuit Of Federal IT Cost Transparency. PR Newswire.* PR Newswire Association LLC, 14 May 2015. Web.

A Data-Driven Approach to Managing IT Cost and Value

This report recommends an approach to optimizing cost efficiency and value that has matured in both the private and public sectors over the last eight years. Called Technology Business Management — or TBM — this approach provides a set of disciplines based on real-world implementations and experiences at some of the largest and most complex enterprises and governments around the globe. These disciplines begin with transparency and extend to benchmarking, shaping business demand, and both planning and governing IT spending over time.

Repeatedly when companies eschew these best practices and try to develop internal frameworks and taxonomies that are not based on industry standards, internal disputes over definitions and data sources can overshadow and ultimately marginalize efforts to rationalize and control spending. Fortunately, the TBM taxonomy and TBM model we introduce and explain in this report provide a proven roadmap for tracing IT spending from the general ledger all the way through to the people and technology resources that consume those dollars. When automated, TBM eliminates the data inconsistencies currently plaguing the self-reported scorecards decision makers are relying on to make decisions today.

And, when this information comes in the form of interactive dashboards, decision makers have the actionable information they need to ensure better outcomes, reduce costs, and improve value for the taxpayer dollars that are spent on technology. The information displayed on ITdashboard.gov provides a good example of a very high-level view of what these dashboards can do. But by adding layers of detail, and by emphasizing a total cost perspective (i.e., acquire, develop, operate, and maintain), TBM exposes costs and consumption at the asset, application, and service levels where money is spent and benefits are directly provided.

This data-driven approach provides IT leaders with powerful tools they need to make the cost-for-performance tradeoffs that are so essential to the good fiscal management, resource optimization, and technology rationalization and consolidation decisions that lie at the heart of TBM.

What is Technology Business Management?

Technology Business Management (TBM) is a value-management framework instituted by CIOs, CTOs, and other technology leaders. Founded on transparency of costs, consumption, and performance, TBM gives technology leaders and their business partners the facts they need to collaborate on business-aligned decisions. Those decisions span supply and demand to enable the financial and performance tradeoffs that are necessary to optimize run-the-business spending and accelerate business change. The framework is backed by a community of CIOs, CTOs, and other business leaders on the Technology Business Management Council.

To gain alignment between IT, Finance, and Agency leaders, TBM provides a standard taxonomy to describe cost sources, technologies, IT resources (IT towers), applications, and services. The TBM taxonomy provides the ability to compare technologies, towers, and services to peers and third-party options (e.g., public cloud). Just as businesses rely on generally accepted accounting principles (or GAAP) to drive standard practices for financial reporting — and thus comparability between financial statements — the TBM taxonomy provides a generally accepted way of reporting IT costs and other metrics. A simple view of the TBM taxonomy is shown below.

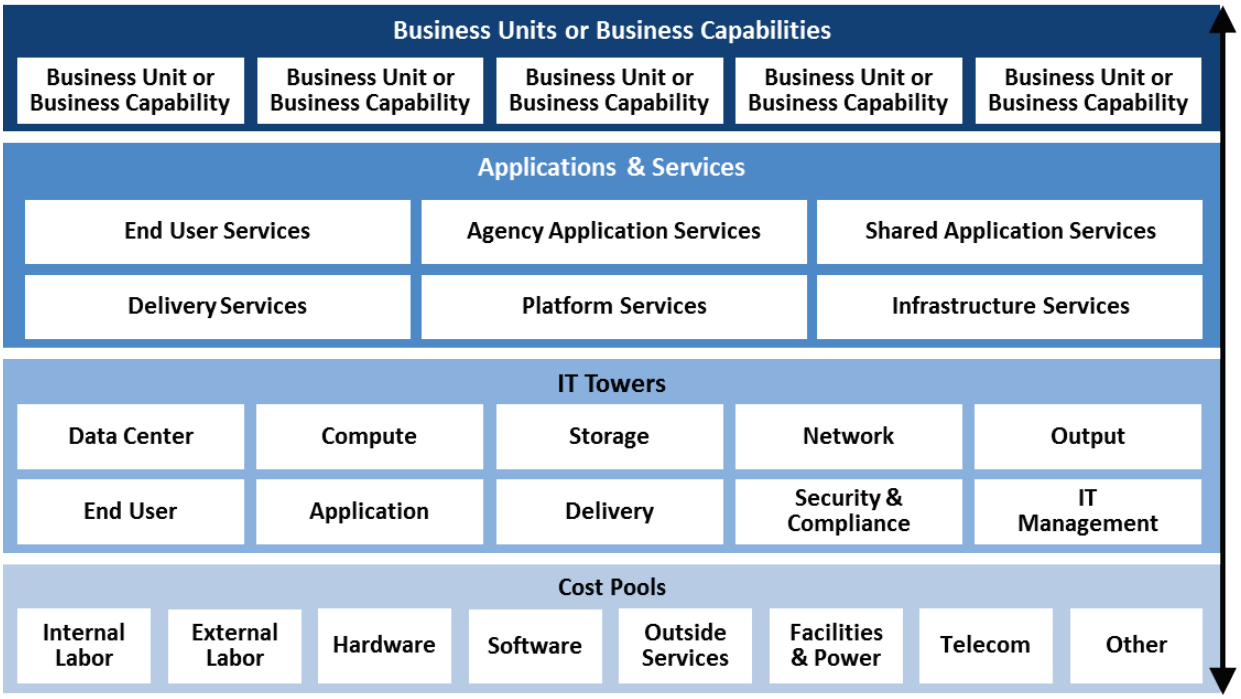


Figure 2: The TBM taxonomy provides a standard set of categories for costs and other metrics

TBM also leverages a tool called the TBM model for mapping and allocating costs and resource consumption from their sources to their uses, from the hardware, software, labor, services, and facilities IT leaders procure to the applications and services they develop, deliver, and support. In essence, the model is what translates between the layers of the taxonomy (e.g., IT Towers to Applications & Services). The TBM model includes the taxonomy objects and layers plus the data requirements, allocation rules, and metrics needed to create transparency and enable the reporting that is needed for the value conversations of TBM.

The TBM model relies on the TBM taxonomy to bring into agreement often disparate and contentious definitions of IT cost components and object classes. This creates a common language so that the terms *server* and *compute* for example are understood by everyone (IT and non-IT stakeholders alike) to mean the same thing and to include the same types of underlying costs calculated using the same methods.

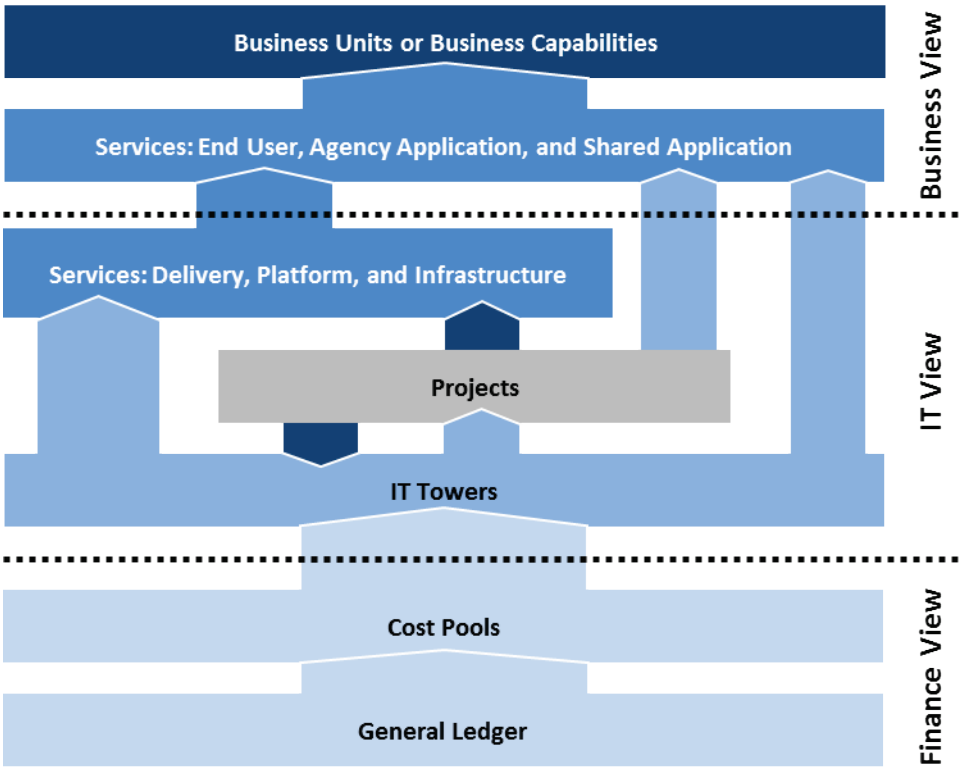


Figure 3: The TBM model translates from a finance view of costs to an IT view of towers, projects, and services and then into a business view of costs

By using the TBM taxonomy and model, agency CIOs can illustrate, for example, how user demand shapes the cost of applications, services, and technology architectures they maintain. And non-IT leaders can use the same data and insights to guide their consumption (demand).

Perhaps more importantly, these TBM tools allow for benchmarking and trend analysis of IT costs. This includes comparing the unit costs of technologies, such a virtual Windows server or a terabyte of tier 1 storage, from one agency, vendor, or data center to another. It also includes comparing unit costs over time, or even looking at ratios such as the IT cost per employee or the storage cost as a percentage of total IT spending.

These are powerful tools used more extensively in the private sector. Specifically, TBM is employed by a diverse array of over 300 private enterprises, from ExxonMobil to Microsoft to First American. But it is not limited to the private sector: TBM is used by government and quasi-government organizations including the U.S. General Services Administration (GSA), Fannie Mae, Freddie Mac, Federal Home Loan Bank of San Francisco, and the State of Washington. Because these private and public institutions share similar levels of complexity and annual IT spending — from tens of millions to billions of dollars — with federal agencies and mission areas, TBM has been proven to work at the scale and complexity needed for the federal government.

Accelerating Transparency with the TBM Taxonomy

"When we added Manheim to the Autotrader group of companies to form Cox Automotive, the hardest part of integrating financial models was learning the structure of an unfamiliar general ledger.... After that, the standard TBM taxonomy had already given us an industry-standard set of categories and compositions, and we already knew how to map GL cost centers and accounts into the model. This used to be something we'd need outside consultants to come in and do, but we were able to onboard millions of dollars in spend and normalize it into our TBM model in just 72 hours."

— Mark Satterfield, VP of IT, Cox Automotive

Source: Tucker, Todd. *Technology Business Management: The Four Value Conversations CIOs Must Have With Their Businesses.* Bellevue, WA: Technology Business Management Council, 2016. 222. Print

Using Transparency to Enhance Technology Decision Making

Like their private sector counterparts, federal IT leaders increasingly employ business principles to run their organizations like those of any other service provider. To do this, they must analyze costs and other metrics in a consistent, meaningful way. Unfortunately, financial accounting models are not sufficient because United States Standard General Ledger (USSGL) accounts, responsibility centers, cost centers, and other accounting mechanisms do not provide useful metrics for leaders outside the CFO's office.

For example, the USSGL can tell IT managers how much they have spent on hardware (CapEx) or on maintenance and support services (OpEx). But the USSGL can rarely tell them the total cost to deliver infrastructure, services, or applications, each of which is comprised of various elements from different cost pools — hardware, software, facilities, internal and external labor, telecommunications, and more.

This total cost perspective is missing from the USSGL. The data is there but it is buried in a variety of accounts, account descriptions, cost codes, and other structures. These facts are not linked in a way that allows IT leaders to put IT spending into context, such as the outcomes it engenders (like reducing the time and cost per tax return or reducing the person-hours required to process a single passport). This situation obscures IT spending, impeding tradeoff decisions that are necessary to improve value.

Not only do IT leaders need linked metrics to understand their total costs, they also need them to manage the unit costs of their technology towers, applications, and services. For example, federal IT leaders need to compare their unit costs to industry peers and third-party alternatives (e.g., public cloud). They must communicate costs in a way that makes sense to their agency and mission area partners (i.e., the consumers of IT services). For all of these purposes, simply pulling cost data from the USSGL piecemeal falls short.

The TBM taxonomy and model allow IT executives and their agency and mission area counterparts to report a shared set of operational *and financial* metrics. They are able to accelerate decisions around where to fund vs. retire applications, consolidate vendors, migrate applications to cloud, consolidate storage, servers, and data centers, and build business cases for technology refresh investments.

The taxonomy standardizes terminology across agencies, mission areas, finance, and IT. This taxonomy is then fed into a cost model. Modeling allows everyone to see which costs are related to which applications, services, and business units. The converse is also visible: TBM shows how consumption drives costs. Decision makers can start at either end of the model — at the GL/cost pool layer or at the business unit layer and drill down to figure out where monies are being spent and on what technologies and services.

This approach allows managers within IT functional towers like compute, storage, applications, and support, to see exactly when their costs are in line with budgets or at odds with targets for spending. These insights are also benchmarkable against existing industry-standard data sets so IT leaders can make informed decisions about which services to target for reduction, which to tolerate, and which services are performing at or above expectations compared to their peers. The result is continuous improvement in run-cost efficiency to avoid defunding Development, Modernization, and Enhancement efforts.

TBM not only provides insights, it helps CIOs and CFOs accelerate important initiatives such as:

- Becoming a transparent broker of services to the business by providing clarity into costs from third parties (such as cloud providers and consultants), internal consumption, and total cost of ownership (TCO) of owned assets (such as servers and storage networks);
- Eliminating technical debt by providing a more complete view of TCO, including the costs to maintain and support applications and technologies that were put into production with less than optimal code; and
- Negotiating better outsourcing contracts by providing a clearer perspective of internal costs and consumption to ensure that vendor proposals are complete.

The question isn't if TBM is applicable to the federal environment — it is — but, given the right tools, how can the facts TBM provides about cost, consumption, utilization, and other aspects of IT help accelerate important goals and make better decisions?

Using TBM Principles to Support FITARA Implementation

Federal IT leaders face many of the same challenges as their private sector counterparts — heightened expectations to retire or modernize legacy systems, consolidate data centers, eliminate redundant systems, and optimize spending. Attaining these goals will require new IT strategies, processes, systems, roles, and ways of making technology decisions that impact stakeholders well beyond IT. Federal IT leaders will need to understand and be able to communicate exactly where, how, and why IT spending occurs.

Through the TBM Council, hundreds of private- and public-sector CIOs, CTOs, and other IT leaders collaborate on standards (e.g., the TBM taxonomy, TBM metrics) and best practices to answer the same questions agency CIOs are now asking such as:

- What are the top drivers of IT spending?
- Who are my top consumers of IT resources and what do they cost the organization?
- Where are the best opportunities to cut spending while maintaining effectiveness?
- What is the fully loaded cost to build and run the applications and services we use?
- Are our operations and maintenance (O&M) resources being used efficiently?
- Are development, modernization, and enhancement (DME) funds being used wisely?

To meet FITARA mandates, agency CIOs should leverage the insights and experiences of the TBM Council members, who regularly exchange ideas and knowledge on how best to answer these and many other important questions related to IT spending.

Leveraging Transparency to Inform IT Consumers

"It was a bit of an eye-opener for a lot of our business leaders in two big ways. One, they realized that they were using a whole lot more IT than they imagined. Maybe in the back of their minds they just thought everybody got a computer and a phone and just went about their business. Second, they realized that there was a whole lot more to what they were consuming. They had no idea there were so many incremental costs to running an application.... We've got a CAD (computer-aided drawing) viewing tool for our engineering folks. There's no license fee, it's just a 'freeware' viewer. But it sits on 500 workstations and generates an enormous amount of support calls. So for a free application, it's very expensive from a support labor perspective."

— James LaPlaine, SVP & CIO, AOL

Source: Tucker, Todd. *Technology Business Management: The Four Value Conversations CIOs Must Have With Their Businesses.* Bellevue, WA: Technology Business Management Council, 2016. 218. Print.

Commission Recommendations

This report includes recommendations in the following categories:

- **TBM Taxonomy and Metrics** — a standardized language for describing what IT delivers and at what cost, along with consumption and composition for meaningful analysis, benchmarking, and planning
- **Financial Accounting and Reporting** — minor adjustments to the way federal agencies account for IT spending
- **Governance and Standards** — policies and other steps to ensure Technology Business Management programs mature and deliver improved decision-making capabilities
- **Organizational Capabilities** — roles, responsibilities, and other human considerations for improved transparency and decision making
- **Functional Capabilities** — tools, cost modeling, and other requirements needed for effective and sustainable transparency

TBM Taxonomy and Metrics

One of the major challenges to overcome when linking technology spending to the value it provides is one of semantics. Too often, IT and their mission-side counterparts do not understand each other because they do not possess the vocabulary needed to talk about IT in terms of mission area outcomes, needs, and desires.

What is lacking is a common lexicon that maps investment categories, object classes, and classifications used in the federal budgeting process to the IT resources, applications, and services they comprise. As a result, agency CIOs find it impractical to communicate or evaluate their expenditures in terms that are familiar to their own technology leaders and to the agency leaders they serve. They also struggle to evaluate spending with suppliers and vendors, including public cloud services.

This is not to say that agency CIOs cannot show program expenditures or individual investments. These dollars and resources are reported on an annual basis. However, the costs to operate, maintain, and support federal IT systems over time are difficult to evaluate and compare. There is no consistent way to decompose these expenses and expenditures for review and benchmarking. Instead, agency CIOs see aggregate amounts and how they compare to budgets over time, but with no ability to gauge cost-effectiveness.

Agency CIOs need a common language for describing both commodity IT products and the applications or services that depend on them. The Commission focused a lot of time and work on this problem and

recommended solutions. The result is a standard federal TBM taxonomy that defines cost pools, IT towers (resources), applications, and services.

Much like other standards and frameworks — think of the guiding principles of GAAP for accounting — TBM relies on rules for governing how IT expenditures and expenses are categorized and reported. However, TBM goes further to provide a taxonomy for reporting the total cost to build, buy, operate, maintain, and support IT products, applications, and services. This TBM taxonomy, born in private- and public-sector IT departments, provides the necessary categories.

With the TBM taxonomy, IT costs can be compared over time and benchmarked against other agencies, mission areas, and private-sector companies in a meaningful way. This is especially powerful for the standard categories known as IT towers: data centers, compute (i.e., servers, including cloud), storage, networking, end user, application (e.g., development, support), security & compliance, and other types of costs.

Furthermore, the taxonomy is hierarchical, with the lowest layer defining standard accounting cost pools (e.g., labor, hardware, software, outside services), the middle focused on the IT towers described above, and the upper layer providing for the applications and services that are delivered by agency CIOs to their agencies and other consumers.

The goal of TBM taxonomy is to enable a consistent method to define, analyze, and report on all aspects of IT spending and to enable the measurement of IT value for improved decision making. When coupled with an IT portfolio approach to project management, this can include all IT activities across both operations and management (O&M) and DME funding as well as costs directly within IT's purview and technology costs embedded within Agency mission areas.

Recommendation 1. Supported by the OMB, agency CIOs should adopt the standard TBM taxonomy for budgeting (planning) and reporting IT expenditures and for driving consistency across stakeholder groups.

The Commission recommends that the OMB provide guidelines for federal agencies to use the standard TBM taxonomy of cost pools (and sub-pools) and IT towers (and sub-towers) for submitting their annual IT budget requests. These guidelines may be part of the annual OMB Circular A-11 on preparing, submitting, and executing the fiscal year budget. This will allow federal CIOs, CFOs, and other stakeholders to better understand and evaluate planned IT costs at a more granular level. This will also allow the OMB to more easily compare expenditures across the federal government.

In using the standard TBM taxonomy, federal agencies will empower their CIOs to perform more meaningful reviews of all major IT investments as required by OMB Circular A-11 (see section 51.3 of the 2015 circular). In particular, putting investment resources into IT tower and sub-tower terms allows CIOs and their staff to better review the cost-effectiveness of the inputs used for delivering program outcomes.

Using the TBM taxonomy also enables more meaningful benchmarking of IT resources consumed in delivering federal programs and services.

Agency CIOs should also employ the standard TBM taxonomy, through the lifecycle of IT services and investments, to drive consistency across many stakeholder groups: program managers, project managers, OMB, Government Accountability Office, IT governance, Office of the CFO, and more. In essence, CIOs should define data once and use it many times.

Recommendation 2. Agency CIOs should employ a standard set of TBM KPIs to allow comparability of cost, performance, and value.

Metrics are a vital aspect of almost any program for managing performance, including cost effectiveness of IT. While the number of metrics that a TBM program can deliver is vast, the Commission recommends agency CIOs employ 15 key metrics (we refer to them as Key Performance Indicators or KPIs) to facilitate governmental and commercial comparisons of IT cost and performance and to manage tradeoffs, such as TCO vs. risk. As such, these KPIs include metrics that are made possible by the TBM taxonomy and model and others that often come from other sources (e.g., service level management, customer satisfaction surveys).

The following metrics are categorized according to TBM outcomes: improving cost for performance, aligning the IT portfolio to agency goals and missions, investing in innovation and increasing agility. The following table explains each metric.

Additional metrics that are enabled by the TBM taxonomy in a way that facilitates benchmarking can be found in Appendix B.

KPI	Description	Justification
Cost for Performance		
Unit Cost Actuals vs. Targets for IT Towers	Unit cost targets for towers should be set annually during planning based on budgets, expected units consumed (from capacity planning), and **federal- and/or private-sector** benchmarks (where available). Actual cost per unit should be compared monthly or quarterly. These should be set for the majority of your tower spending.	With infrastructure consuming approximately 60% to 70% of overall IT spending, this KPI holds tower owners (and vendors or suppliers) responsible for cost efficiency and can dramatically improve overall value for the money spent on IT.

KPI	Description	Justification
Unit Cost Actuals vs. Targets for Business-Facing IT Services or Apps	Unit cost targets for services or apps (inclusive of towers that support them) should be set annually during planning based on budgets, expected units consumed (from capacity planning), and industry benchmarks (where available). Actual costs per unit should be compared monthly or quarterly.	Most agency leaders only understand costs in terms of the services or applications they consume, not the towers or infrastructure technologies that comprise them. Managing the unit costs of services or apps helps agency CIOs shape demand and consumption.
Business-Facing IT Services or Apps Meeting SLAs	Based on total cost of the portfolio, this percentage reveals how much of the application or service portfolio is meeting service-level agreements. It is a weighted metric based on relative TCO.	Meeting service level agreements with business partners is essential to delivering value for the money. This KPI helps agency CIOs balance cost optimization with service quality.
Customer Satisfaction Scores for Business-Facing Services	This measure reflects the outcome of surveys of the users of business-facing services. This may include Net Promoter Score or other mechanisms, but should not be limited to the service or help desk. Instead, all major services should be included in the survey.	Performance should be viewed from the perspective of the business users. While SLA attainment is an important, subjective measurements of performance can be very useful and identify areas where SLA attainment alone is insufficient.
Business-Aligned Portfolio		
Actual Spending (TCO) against Targets for Agency Outcomes (or Categories)	A portfolio-based view of TCO (OpEx and CapEx, including projects) by agency business outcomes (e.g., mission areas, business capabilities, lines of business served) should be produced monthly or quarterly for executive steering committee or governance reviews.	Since IT is often provided as a set of shared services, facilitating governance conversations with corporate executives is important to ensure agency and mission alignment. These conversations should drive top-level mandates for change, such as changes in spending for specific areas of the business.
Actual Spending (TCO) against Targets for Business-Facing Services or Apps	A portfolio-based view of TCO (CapEx, including projects, and OpEx) by the services and/or apps that each agency consumes should be produced monthly or quarterly and presented to the agency leaders.	In concert with top-level mandates, agency and consumer-level discussions about spending provides additional insights about where consumption and costs can be optimized or where additional investments are needed.

KPI	Description	Justification
TCO by Vendor Category	A view of CapEx and OpEx by vendor or supplier category (e.g., strategic, preferred, transactional) should be produced and reviewed quarterly.	The right vendors and suppliers can bring tremendous value to any business or agency. Therefore it is important to ensure spending is being focused on the right third parties and according to agency or mission priorities.
TCO by TIME	A view of app and/or service TCO (CapEx and OpEx) by TIME (tolerate, invest, migrate and eliminate) or another rationalization model should be produced quarterly. This should include trends (up or down from prior period) to identify anomalies (e.g., increased development spending on apps marked for elimination).	Having a plan for rationalizing applications or services is vital to simplifying the IT estate. However, it must be governed by carefully monitoring resources (via dollars) against each category.
Investment in Innovation		
Operations & Maintenance (O&M) vs. Development, Modernization and Enhancement (DME)	O&M (may be called Run-the-Business) spending includes both capital and operating expenditures needed to operate and sustain agency operations. O&M activities are vital to each agency but there is a tendency for them to increase year-over-year as previous DME investments impact ongoing operations. O&M vs. DME spending should be reported each quarter.	If cost for performance and business alignment are managed well, those efforts should help free up investment for innovation (DME). Therefore, this KPI not only helps ensure O&M is being optimized, but it puts additional emphasis on each agency managing its demand and understanding the tradeoff of existing consumption vs. new capabilities.
Investments against Targets by Value Category	A view of investment spending (may include both O&M and DME) by category (e.g., replace, maintain, enhance, or new) against targets should be produced quarterly.	This KPI helps IT and agency business leaders understand the impact of technical debt or modernization requirements that might be crowding out new or better capabilities.
Projects On Time, On Budget, On Spec	A view of total project spending and headcount split by those that are tracking to scope, budget and deadline should be produced quarterly. It should be split by executive (agency, program or mission) sponsors and reviewed during quarterly.	This KPI demonstrates how well IT is delivering on its project-related commitments. By using dollar value of projects, as opposed to the raw number of projects, this KPI focuses the discussion on the larger projects that likely have a bigger impact on the business.

KPI	Description	Justification
Enterprise Agility		
IT Delivered by Cloud against Targets	This measures how much of IT (as a percent of Opex) is delivered as private or public cloud services to the business. Clear criteria for which services are designated cloud services are needed for this KPI to be meaningful.	Public and private cloud services are, by definition, rapidly elastic and on-demand, and their consumption is measured to provide a basis for allocating costs. Cloud enables an agency to use IT services as needed, providing agility and connecting consumption to the costs incurred.
Variable Cost Ratio by Business-Facing Service against Targets	This KPI measures how much of the business-facing IT costs (i.e., apps or services delivered to the business) are fixed (i.e., static regardless of consumption) or variable (i.e., vary in line with volumes of consumption). Targets should be set while considering implications for short- and long-term total costs.	A more variable cost structure is beneficial in situations where business volumes are falling or are expected to rise and fall. A variable cost structure helps match IT costs with business revenues. However, targets for variable costs should be set based on tradeoff considerations.
Discretionary Project Spending against Targets	Discretionary projects are those designed to enhance services or introduce new ones, as opposed to mandatory investments such as compliance, capacity upgrades, reducing technical debt and maintenance.	When mandatory spending consumes a high percentage of project spending, an agency has little ability to innovate or respond to new threats or opportunities. Greater discretionary spending as a percentage of the total indicates a greater capacity to innovate, as funds can be shifted more easily.
TBM Data Quality Index	This measures the overall state of data quality for TBM. It measures missing data sets, gaps in data, breakage between data sets, and the use of assumptive data in driving allocations. It should trend in a positive direction, although setbacks may occur after major changes in the model or data sources.	As IT leaders become data-driven in their decision making, better data quality for TBM means they can make better decisions for improving business value. Better data also improves operational maturity, making it possible to run more efficiently and reliably.

Recommendation 3. Agency CIOs should benchmark significant IT tower and sub-tower costs on an annual basis.

Commonly used by private-sector CIOs and CFOs, benchmarking is a powerful yet often misunderstood tool for CIOs to rein in costs and improve efficiency. The concept of benchmarking is simple: it is the act of comparing one agency's cost and performance to that of a peer group (outside or inside the organization), a standard, or over time (from a baseline using trend analysis) using similar metrics with

agreed-upon meanings. However, it is often challenging to make an apples-to-apples comparison. The TBM taxonomy helps make comparisons useful through the use of common terminology and hierarchy.

The Commission recommends a combination of benchmarking approaches including comparisons with external peers (at least every three years or during major contract renegotiations), between agencies (at least every year), and over time (quarterly or semi-annually). Agency CIOs should focus benchmarking efforts on towers and sub-towers, where unit costing is most practical and where internal and external comparisons are most easily made. Where feasible, unit costs and consumption should be preferred to ratios or percentages. Benchmarking tower-level unit costs will help ensure IT sourcing is cost-effective.

When evaluating benchmark comparisons, agency CIOs and their stakeholders must remember that cheaper is not always better. If spending is consistently higher than a peer group benchmark, for example, then the agency may be unique in some way compared to the peer group, or the data supporting the benchmark could be off. Either way, benchmarking will reveal whether something is amiss and worth further investigation.

Furthermore, agencies with IT costs well below peer group averages may indicate higher risk in some way, such as running tight on capacity or putting off much-needed hardware refreshes to save money. Regardless of where the data leads, CIOs should focus on achieving the best cost-for-performance ratio for the organization, not just the best cost (or the best performance).

Benchmarking is especially useful in negotiating with vendors. Agency CIOs should use benchmark comparisons to drive conversations about the cost-effectiveness of their vendors, including public cloud services. Then, they should use those comparisons to renegotiate with their vendors and bring their rates in line with peers.

Using Benchmarking to Evaluate Spending

"Our infrastructure benchmarking was very influential with our CFO. We were able to show her that the cost of running our infrastructure is in line with the industry, and we were benchmarking ourselves against the top quartile. In many areas we were doing well, and in other areas we could do better. But we had a plan on how to improve in those areas. And that changed the discussion with the CFO from 'We're just spending money' to 'We really are managing what we're doing.'"

— Steve Adams, IT Finance Leader, Kaiser Permanente

Source: Tucker, Todd. *Technology Business Management: The Four Value Conversations CIOs Must Have With Their Businesses.* Bellevue, WA: Technology Business Management Council, 2016. 102-103. Print

Financial Accounting and Reporting

The TBM taxonomy provides for an alternative view of spending to one normally coded into a federal agency's accounting system. This is no different than in the private sector, where a firm's general ledger (GL) captures expenses and expenditures that are needed for corporate financial reporting, not managerial cost-optimization decisions.

In government, the systems and codes are different from those in the private sector. Object classes are the government equivalent to GL accounts, for example. Fortunately, the Commission found that those object classes generally map well to the cost pool framework of the TBM taxonomy. This means that the base of the taxonomy and the foundation of the federal TBM cost model work well with existing federal accounting object classes.

Another difference between federal and private-sector systems is where spending is managed and recorded. In the private sector, IT spending is often found in budget (cost) centers for the IT department. In the federal government, however, spend is managed via appropriations and is recorded in funds. These funds often cross-functional lines and may contain a combination of IT and non-IT spend. For example, in a private-sector organization, a new server would be coded in the general ledger to the computing group within the IT department; in the government, the same purchase may be charged to a program fund used for many other types of expenses, both IT and non-IT.

The goal of the TBM taxonomy and corresponding TBM cost model is the same for both federal and private-sector agencies: to report costs in terms that are meaningful to stakeholders. In this section, the Commission provides recommendations for using the TBM taxonomy with current federal accounting systems and standards.

Recommendation 4. The GSA's Financial Systems Integration Office (FSIO) should establish a common coding scheme for TBM taxonomy IT tower information.

In order to model IT costs according to the TBM taxonomy, federal agencies must be able to map (connect) financial accounting transactions such as hardware purchases, payments for services, payroll, and even depreciation amounts, to the IT towers and sub-towers they support. Since object classes, funds, and program codes do not normally support this mapping, another option must be employed. The Commission recommends adopting a common coding scheme for IT tower information.

According to the GSA, the Common Government-wide Accounting Classification (CGAC) structure is a standard way to code and categorize financial transactions. Issued by the Financial Systems Integration Office (FSIO), CGAC serves as a standard financial structure for all federal agencies in order to deliver internal and external reporting, while allowing for agency-specific needs. CGAC is being implemented as agencies modernize their financial systems.

The Commission recommends that the GSA FSIO create a common coding scheme to be used by federal agencies in recording IT financial accounting transactions. In particular, they should consider using the cost center code or activity code in the CGAC structure. Cost centers and activity codes are agency-defined and are optional, according to CGAC. While agencies may use these codes to capture tower and sub-tower information, a common scheme would not only be more efficient government-wide but would also allow for easier reporting and implementation of TBM tools.

A cost center is defined as "a logical grouping of one or more related activities or organizational units into a common pool for the purpose of identifying the cost incurred." Therefore, it appears to be the most logical code for capturing TBM taxonomy towers and sub-towers.

Recommendation 5. When implementing TBM, federal agencies should use an accrual-based calculation of costs, not a cash-based methodology.

Cost benchmarks and ratios are normally based on the total cost of ownership (TCO) for assets and services. In turn, these TCO figures are calculated using accrual-based methods that match expenses to the periods in which they provide benefits. These methods include accounting mechanisms such as depreciation, amortization, prepaids, and accruals. In addition to better matching costs to their benefits, accrual-based costing provides a more accurate view of the cost to maintain and deliver IT services and their long-term impact on agency budgets and resources.

The Commission recommends that federal agencies use accrual-based costs, including depreciation and amortization, as opposed to cash-based expenditures for reporting and management, including benchmarking. These figures are reported in an agency's or component's *annual statement of net costs*.

Recommendation 6. Federal agencies should code financial transactions with the corresponding TBM taxonomy IT tower.

In order to avoid a change in financial account systems or transaction schemas (e.g., CGAC), federal agencies should code financial transactions with the appropriate TBM taxonomy IT tower. Doing so will support the accurate total costing of IT towers for reporting, benchmarking, and cost management with a minimum of additional effort.

Note that the TBM model supports the costing of IT sub-towers by using operational data, so financial transactions do not need to be coded with sub-tower information.

Recommendation 7. Federal agencies should adjust the financial reporting process to ensure IT spend can be identified from other spend.

Since IT financial transactions are often commingled with other types of transactions, agency CIOs find it difficult to identify, report, and evaluate total IT spending for their agencies. Furthermore, this

commingling will make it difficult to isolate and map IT spending into towers and sub-towers, a necessary step in benchmarking and reporting.

The Commission recommends that federal agencies isolate their IT spending in their financial systems. Isolation can be achieved via object class codes, such as adding a designation to codes when the spending is for IT, or by ensuring that the fund or organizational codes correspond to IT appropriately.

Recommendation 8. The OMB should ensure each agency has a budget bureau code dedicated to the Office of the CIO.

In the OMB MAX budget system, the OMB has assigned agency and bureau codes that are used to identify and access data in the budget database. Some agencies have a specific code set up for the Office of the Chief Information Officer, but most do not.

The Commission recommends that the OMB designate a Bureau code for the Office of the Chief Information Officer for all agencies. This will help ensure, as directed by the FITARA Act, that agency CIOs have a significant role in IT decisions, including annual and multi-year planning, programming, budgeting, execution, reporting, management, governance, and oversight functions.

Governance and Standards

In the private sector, successful TBM programs are the result of an agile approach and continuous improvement as opposed to a "big bang" approach to implementation. TBM programs often begin relatively small, focused on establishing a base level of transparency using the TBM taxonomy and maturing over time. However, while private-sector IT leaders often have the benefit of fewer regulations and standards, this is a mixed blessing for TBM: on one hand, they can operate more freely than many of their federal peers; on the other hand, they often lack the very standards that make TBM easier and faster to implement.

The Commission makes several recommendations for the OMB, GSA, and agency CIOs to accelerate transparency and the adoption of the TBM taxonomy.

Recommendation 9. The OMB should establish a government-wide TBM governance board and designate a center of excellence for cross-agency implementations.

Adoption of the TBM taxonomy and disciplines for managing cost represent a unique opportunity for agencies to improve the value of IT spending. However, each agency should not be left to act on its own. The Commission recommends that the OMB take the lead on forming a government-wide governance board comprised of members across the federal government who set the strategic direction for TBM in the federal government. The Board should provide the long-term vision and direction for TBM, with an

emphasis on increasing maturity over time and enabling outcomes such as improving cost efficiency, portfolio management, and agency agility.

The OMB should also consider designating a center of excellence for TBM nationally. In particular, the OMB should consider the GSA for the TBM center of excellence. The GSA is the first major U.S. federal agency to implement the TBM taxonomy, cost modeling, reporting, and metrics. In doing so, the agency is paving the way for other agencies to do the same. Having recently established an office (the United Shared Services Management Organization) to boost the adoption of shared services, the GSA is in a unique position to do the same for TBM.

The output of the governance board and center of excellence should include guidelines for TBM roadmaps, templates for accounting policies and protocols, standards for data acquisition and quality management, and reporting best practices.

Recommendation 10. Cabinet-level agency CIOs should establish policies and processes to ensure consistent application of TBM taxonomy and reporting across subordinate agencies.

The power of the TBM taxonomy is greatest when it is applied consistently by those who use it. In federal environments, having agencies, sub-agencies, and other entities all using the same taxonomy allows for benchmarking and other comparisons, but only if similar processes and policies are applied in modeling and describing the underlying costs.

The Commission recommends that cabinet-level agency CIOs should establish policies and processes to ensure consistent application of TBM taxonomy and reporting across subordinate agencies. These would include guidelines for coding IT financial transactions (per Recommendation 5), data quality reporting, specifying and using metrics, making agency-specific extensions to the TBM taxonomy, and selecting a benchmarking peer group.

Recommendation 11. Agency CIOs should develop a multi-year roadmap both for reporting and data maturity and for driving continuous improvement in cost efficiency and value.

The Commission recommends that agency CIOs develop and maintain a TBM roadmap and regularly share the roadmap (and current state) with stakeholders.

A TBM roadmap is also essential to adoption. It is the plan for any TBM journey. The roadmap outlines the phases that agency CIOs will go through with TBM and shows how each step builds upon the ones taken before it. Fully implementing a roadmap typically takes between 12 to 18 months and usually includes three phases:

Phase 1 — Build the Foundation: Phase 1 creates a foundation of cost transparency where the TBM team begins identifying and sourcing cost and consumption data from cost pools, USSGL accounts, cost centers, mission areas, project management offices, HR, etc. — wherever outcomes are looking to be influenced.

Some organizations use this phase to begin changing their IT planning process as well by leveraging the clarity into their spending to accelerate IT budgeting and forecasting.

Phase 2 — Move Up the TBM Taxonomy: With the foundation in place, Phase 2 focuses on application TCO and service costing. Having metrics at this level of the model enables agency CIOs to evaluate and discuss the value of IT spending, possibly for the first time, with their stakeholders (e.g., agency leaders). But it also supports application rationalization initiatives and potentially sets agencies up for demand-based planning (e.g., zero-based budgeting) based on application requirements.

Another direction to take during this phase is to dive deeper into tower costs. This involves incorporating more granular asset data and cloud billing data into the model.

In taking these steps, agency CIOs will begin to understand why costs deviate from benchmarks and identify areas of waste, such as underutilized and orphaned assets.

Phase 3 — Connect with the Business: During Phase 3, agency CIOs should improve visibility into consumption and costs at the mission area, line of business unit, and business capability level. This sets them up to deliver a bill to their IT consumers and start reshaping demand to optimize spending. At this point, agency CIOs will have connected the TBM model from the bottom to the top.

Recommendation 12. Agency CIOs should take specific steps to ensure better alignment of reporting between their offices, their Offices of the Chief Financial Officer, and the OMB.

To achieve transparency, TBM utilizes data inputs from multiple systems well beyond the federal financial management systems. From data center management platforms to project management tracking solutions and every possible metric in between, TBM ties spending back to desired outcomes (such as tracking server consolidation efforts or increasing the number of customer-facing projects in the pipeline) and, therefore, value.

Achieving this level of transparency in federal IT spending requires better alignment between each agency's Office of the CIO (OCIO) and Office of the CFO (OCFO), program managers, project managers (or PMO) as well as the OMB. Currently, each of these stakeholder's data requirements and reporting needs do not adequately support one another's goals and objectives.

To enhance alignment, the Commission recommends agency CIOs put the following elements in place in concert with their agency and OMB counterparts.

Traceability

The Commission recommends that agency CIOs work with their program managers and CFOs to establish consistent and traceable project parameters such as project names (identifiers), project scope, cost, scheduling, staffing, and quality. This information and data are used by governance for decision-making, by project managers (PMs) for detailed project planning and delivery, and to set project baselines for performance management and investment health assessments.

Cost and Benefits Framework

Currently, disparate methods are used to assess new investments or changes to existing investments. The Commission recommends that agency CIOs work with their CFOs to establish an agency-specific common cost and benefits analysis (CBA) method (e.g., metrics, criteria, framework, etc.) that both IT and agency mission areas understand and that aids in making technology investment decisions. This method should reflect both the short-term (i.e., annual) investments as well as the longer-term cost to operate a new technology, application, or service.

Reporting Alignment to Reduce Burden

There is a need to align external (i.e., OMB) and internal reporting requirements so that the burden of generating these reports is reduced and value of the analysis is increased by being useful to all stakeholders. While E300/E53 reporting guidelines attempt to provide this alignment, they do not represent efficient reporting mechanisms that can be utilized by both internal and external stakeholders. Therefore, the Commission recommends that agencies standardize their reporting using the E300/E53 language specific to the federal environment.

Organizational Capabilities

TBM is a value management framework for technology leaders and their people. Hence, the roles that people play and the processes they execute are crucial for improving value. The transparency of TBM empowers decision makers such as service owners, BRMs, portfolio managers, and business process owners; they are the consumers of transparency, responsible for improving cost for performance, business alignment, and other outcomes of TBM. Other roles are needed to create transparency with the TBM taxonomy and model, and the processes they execute make TBM possible.

In this section of the report, the Commission makes several recommendations for agency CIOs related to the people and processes needed for TBM.

Recommendation 13. Agency CIOs should establish a TBM office comprised of a program director and any TBM analysts and administrator resources needed for modeling, reporting, and metrics.

The Commission recommends that agency CIOs establish a TBM office with three roles: a TBM administrator, a TBM analyst, and a TBM program director. This TBM office may be a new, stand-alone

function, or it may reside within a governance team, a strategy and planning team, a project management office (PMO), or an IT finance function. Following are descriptions of each role.

TBM Administrator

The TBM system administrator manages the TBM model(s) and data, builds reports, administers TBM system user accounts, and trains users (mostly report consumers). For most organizations, even large ones, it is not a full time job. If the TBM system is highly automated, integrated with data sources, and provides for self-service analytics and reporting, a single analyst is often sufficient to get the job done even for large IT organizations. Indeed, some organizations outsource this role to a third-party provider who delivers the TBM system as a managed service.

TBM Analyst or TBM Architect

The TBM analyst, sometimes called a TBM architect, is pivotal to the success of the program. This professional understands the data and reports, works with data owners and report consumers to improve reporting, analyzes output, and guides decisions.

A good TBM analyst often has served in various IT roles prior to the current role and has learned many of the core disciplines of IT, such as systems administration, project management, service delivery, support, architecture, and application development. This experience not only provides a solid understanding of the data sources coming from IT, it means the analyst may have good relationships with data owners and IT decision makers.

The TBM analyst should understand both finance and enterprise technology and work closely with the TBM administrator to create meaningful reports, help all users understand those reports, and facilitate deeper dives into the data.

If possible, CIOs should staff the TBM analyst or architect role from within their organizations. Fortunately, the TBM analyst job is often seen as an exciting new role, key to improving value or reducing costs and therefore essential to the organization's success. It often appeals to employees who are looking for a new challenge and a way to expand their knowledge. For this reason, it can often be easy to find good candidates from within the organization.

TBM Program Director

Many times, the TBM program director is the IT finance leader (the CFO of IT, if you will). This makes sense when the IT finance leader reporting to the IT organization possesses the right leadership qualities and is thus able to build and manage relationships with key stakeholders. If not, another executive should be assigned or hired for the position within the technology organization.

The TBM program director should be included in the office of the CIO or be part of the agency's IT governance organization. Elevating the TBM program at this level helps ensure IT continues to operate transparently and uses data to drive important technology-business decisions at all levels of the agency.

Recommendation 14. Agency CIOs should clarify which IT personnel are accountable for TBM metrics, and ensure those personnel are trained on how to use and improve them.

What sets TBM apart from other IT financial disciplines is it empowers managers who are responsible for discrete sections of IT (e.g., infrastructure, applications, services) to make value-based decisions about cost that, like ripples in a pond, can have far-reaching effects. Because of this, these individuals should also be considered and treated like the key stakeholders they are.

With the TBM taxonomy and model, agency CIOs will generate more meaningful reports and metrics for managing cost and value tradeoffs. In particular, the agency will create new TCO, consumption, and performance metrics for IT towers and sub-towers, as well as new benchmark comparisons. When used properly, these metrics help agency CIOs review their annual budget submissions for cost effectiveness, set annual targets for improvement, and manage improvements over time. This only works if their people are held accountable for using them.

The Commission recommends that agency CIOs clarify who is accountable for each key metric and ensure they know how to use and influence them. These roles may be located across the Agencies and mission areas. Since TBM is adopted from the top down, it is important to open lines of communication early regarding the program's existence and its goals with leaders in each of these areas.

Based on lessons from the commercial sector, the following roles are often responsible for TBM metrics. Their equivalents should be considered by agency CIOs.

IT Tower Owners

IT tower owners (those who are responsible for servers, storage, networking, application development, security, compliance, etc.) are specialists who have insights into the inner workings of IT delivery. TBM empowers them with the information they need to spot trends that can negatively and positively affect spending and, therefore, outcomes. They should be held accountable for tower TCO, meet or beat unit cost and operational level agreement (OLA) targets, and execute against project plans and metrics, among other measures.

Application and/or Service Owners

Application and service owners decide the quality and quantity of infrastructure needed for what they deliver. Because of this they are in a good position to spot variances, underutilized applications and infrastructure, and they can drive conversations around cost-for-performance tradeoffs with their business-side counterparts in order to ameliorate these situations. They should be held accountable for application TCO, meet or beat unit cost and service level agreement (SLA) targets, and execute against project plans and metrics, among other measures.

Business Relationship Managers (BRMs)

Since service owners often operate at arm's length from their business partners, much like a vendor-customer relationship, they rely on BRMs to understand the business partner, anticipate their needs, and position solutions to meet those needs. The BRM also works with business partners and service owners to define and deliver the right services, create service packages (i.e., different service levels), establish service level agreements (SLAs) and so on. They should be responsible for communicating the consumption and cost of IT services and applications and help their agency consumers make more informed decisions to optimize efficiency.

Service Portfolio Managers

Service portfolio managers work with service owners and business relationship managers to manage the service portfolio. Together, they set the services strategy to support the agency's missions and objectives. Service portfolio managers also define the key performance indicators by which service performance is measured.

****

Regular interaction with this group (and others as they are designated) is crucial to keeping the program on track and generating results. As success leads to success, and as these individuals become intimately familiar with the workings of TBM, our experience has shown they will, of their own volition, ferret out waste and inefficiency to provide significant immediate savings and improve the cost-for-performance ratios so important to the value conversations that form the core of TBM.

Other stakeholders are also important to the TBM process, including:

- External stakeholders such as the President of the United States, Congress, the Inspector General, the OMB, and the public
- Internal stakeholders such as mission owners and users, Office of the CIO staff, and other department and agency staff
- Lateral stakeholders, especially other agency CIOs

These parties should be recognized, included, and consulted using TBM metrics where appropriate so that technology decisions are not made independent of mission area and Agency goals.

Recommendation 15. Agency CIOs should develop and implement a stakeholder rollout and end-user training program.

One of the most difficult parts of TBM is the cultural shift needed to hold application and service owners accountable for the total cost of ownership of the application or service they manage. This is fundamentally different from a cash-based appropriation view of accountability. Just as when private-

sector companies make the shift to managing TCO, agencies will also need a plan to educate the appropriate stakeholders to this new way of viewing cost.

The Commission recommends delivering stakeholder education that is role-based, focusing on the specific questions and needs relevant to the different decision-maker needs. In role-based training, consider the processes needed, such as quarterly business reviews, monthly operating reviews, or monthly budget variance reviews. Each will require specific facts, which can be covered through role-based training.

Recommendation 16. Agency CIOs should implement and monitor key business processes that occur on a regular basis including month-end close, data quality reporting, monthly operating reviews, and quarterly business reviews.

TBM is only as effective as the processes it implements or supports. Formalizing those processes (i.e., making them routine and repeatable) will help agency CIOs standardize reviews and analysis, ensure better accuracy and timeliness of the information, identify and resolve issues in a more timely fashion, and ease the burden of performing those processes on a regular basis.

The Commission recommends that agency CIOs establish (or update) and monitor key TBM business processes. These include two types: those processes that are a core part of TBM and those that are augmented with TBM. The former are new to an enterprise that is adopting TBM but are few in number. Processes being augmented should already exist but may include new elements or involve different people because of TBM.

Core processes that are introduced with TBM include:

- **A TBM month end close** that consists of importing updated data sets, performing initial reviews with IT finance and data owners, resolving any data quality problems, and producing the necessary reports for distribution;
- **Producing a monthly or quarterly bill of IT** for distribution to application owners, line-of-business leaders, and other stakeholders;
- **Performing ad hoc analysis** at the request of decision makers in IT, finance, or even the lines of business;
- **Setting service rates** (prices), usually on an annual basis (during annual planning) or semi-annually or quarterly; and
- **Monthly or quarterly data quality reviews**, focused on identifying data deficiencies and managing improvements against plan.

TBM augments many other processes that agency CIOs (and CFOs) may already have in place, such as:

- **Monthly budget variance analysis by IT finance**, cost center owners, and tower/app/service owners. In many cases, having tower, app, and service owners review their variances is only possible with TBM, so this is a new process for those functions;
- **Monthly operational reviews** by tower, app, and service owners that incorporates financial reviews against budget and targets (e.g., unit cost targets, SLA attainment, etc.);
- **Vendor performance reviews** including financial reviews against vendor-related targets such as unit costs, consumption of vendor services, and spend by vendor categories;
- **Capacity planning and procurement processes** to ensure that capacity costs are properly considered and to evaluate options such as public cloud services;
- **Problem management procedures** whereby analysts consider the cost impact of problems that are causing incidents and tickets;
- **Service portfolio management** including the definition, analysis, and approval of the services in all stages (e.g., pipeline, catalogue, retired, etc.);
- **Demand management** including the use of incentive-based rates (prices) and the use of packaging; and
- **Asset and configuration management** incorporating data quality metrics from TBM along with asset-related financial metrics.

The list could go on. What is most important is to ensure the core TBM processes are implemented, managed and governed, measured, monitored, and improved over time. The non-core processes should be implemented or augmented with TBM based on the goals agency CIOs set for their organizations.

Recommendation 17. Agency CIOs should remain active sponsors of the TBM program to ensure continuous improvement and that program leaders have their support to overcome roadblocks.

Successful TBM programs start with executive sponsorship. Due to the strategic nature of TBM and its impact on incentives and a decision-making model, executive sponsorship is essential for TBM success. The Commission recommends that agency CIOs remain the executive sponsors of the TBM program. Furthermore, sponsorship should not be in name only. Agency CIOs (or a direct report designee) should engage with the team on a regular basis to ensure progress is being made and milestones are reached.

The importance of executive sponsorship to governance cannot be overstated. Without it, people will pay scant attention to the numbers and analysis provided by TBM. They will not act on financial information because it has not become a normal part of their job. They will not help improve the data needed for TBM, because they fear transparency into what they are doing or are embarrassed by the poor quality of their numbers.

Proper sponsorship lights the TBM fire under the feet of a team, and it uses both carrots and sticks to ensure progress moves forward.

Recommendation 18. Agency CIOs should take measures to ensure trust in their TBM model and financial reporting.

When implementing a TBM program, CIOs should not underestimate the importance of trust. TBM depends on an organizational change — roles, responsibilities, accountability — so trust is essential for not only driving adoption of the model by IT and other stakeholders but also for building commitment to the program.

The Commission recommends agency CIOs take active measures to build trust in their TBM model and the associated financial reports. The following measures should be considered:

- Beta test any new model or major model changes with a trusted partner (e.g., agency leader or manager). When the beta is successful, employ the trusted partner to help articulate the benefits of the model to others in the agency.
- Prove the TBM model accounts for every dollar — for every dollar in, there is a dollar out.
- Explain how the majority of costs are allocated through a short, plain-language document. Illustrate allocations with a simple conceptual model. This also comes in handy with auditors who need to review or test the allocations.
- Ensure stakeholders understand how costs are allocated, how to interpret the reports, and what changes they are allowed to make to the reports and to the process, such as modifying the taxonomy to better reflect non-IT-centric mission-area terminology. Resolve any concerns or objections they have.
- Provide drill downs in TBM reporting. Empower report consumers to see what makes up unit costs so they can verify them.

In building better trust in the TBM model, agency CIOs will find less resistance in driving better outcomes. In addition, their people will make decisions faster by taking less time to debate or assess the accuracy of the information they are using.

Functional Capabilities

Employing the TBM taxonomy and modeling IT costs is not possible without the necessary tools and capabilities. Indeed, TBM was born out of other data-driven disciplines by marrying financial, operational, and business data using tools that were often familiar in business intelligence and data analytics circles. The difference is that TBM was built on top of a standard taxonomy and with standard metrics, processes, and disciplines.

The following recommendations describe many of the functional requirements that agency CIOs should consider. These requirements are tool-agnostic, but they are generally impractical without software and automation. Each agency CIO should consider the degree of automation that they need to cost-effectively adopt the TBM taxonomy, model their IT costs accordingly, and generate the metrics they need to manage cost and value.

Recommendation 19. Agency CIOs should implement a TBM system that is capable of serving the requirements for data integration, scalability, cost and resource modeling, reporting and analytics, and security.

Many CIOs have recognized that they are like the cobbler whose children have no shoes. They have built, supported, and maintained business management systems for their business partners without having one for their own people. As a result, their ability to measure, optimize, and communicate value for the money spent on IT has been difficult or impossible.

Agency CIOs must address this shortcoming. The Commission recommends that agency CIOs implement a system that provides for the necessary transparency using the TBM taxonomy. There are many options from which they can choose for their TBM system. These include everything from spreadsheets and business intelligence software to custom developed software and purpose-built packages. But all options should be considered in the context of key system requirements. Below are several key requirements to consider.

- **Cost and Resource Modeling:** The system must be able to create, support, and process the TBM model (or models), including the allocation of numerical data using other tables, lists, or rule sets as weighting criteria that sit at the core of the TBM model.
- **Scalability and Performance:** Since the TBM model and the amount of data that agency CIOs will use are likely to be both very large and complex, the TBM system must scale to meet the task, including both the ability to process large, data-driven models and to provide responsive, real-time analytics and reporting.
- **Data Integration and Quality:** The system must be able to extract, transform, and load data from other tools, automatically. The system must work well with imperfect data and provide methods for measuring and improving data quality. It should support upgrades to datasets as source data matures or reporting needs evolve, so agencies can integrate new data without a significant amount of rework.
- **Reporting and Dashboarding**: The system must provide the reports, metrics, dashboards, and analyses that agency decision makers need. Since agencies cannot predict all of their reporting needs, the ability for report consumers to access and manipulate data and create their own reports is also essential.

- **Real-Time Analytics:** The TBM system must enable decision makers to interact with the data and reports. Users such as financial planners, technology owners, architects, and application owners will have complex, multi-dimensional questions. Commonly, those decision makers need to explore the data in order to answer questions.
- **Security:** The system must be secure and meet federal security and privacy requirements. TBM models often integrate a lot of sensitive data, such as asset lists, payroll data,[6] transaction volumes and more. When sensitive fields are not needed, they should be excluded from the system. Since sensitive data is often required in the model, TBM systems depend on effective security, including user authentication, role-based access controls, and the ability to redact sensitive information within reports.

Fortunately, the need to build these systems in-house is no longer necessary, as there are commercial versions of enterprise-class software readily available in the marketplace today.

Recommendation 20. Agency CIOs should implement a TBM model that allows for the costing of both commodity IT products and the more mission-specific IT products and services.

Especially in public-sector environments, CIOs are often responsible for delivering and supporting technologies that are outside of the realm of traditional IT departments. For example, they may support emergency management systems such as two-way radios or air traffic control systems such as radar control. These will have implications for the TBM taxonomy, including IT towers (the standard taxonomy does not include radios under end user, for example) and applications and services (the taxonomy does not include Common Support Services for Weather, for example). Fortunately, the TBM taxonomy was designed to be extensible.

The Commission recommends that Agency CIOs implement a TBM model that allows for the costing of both commodity IT products (e.g., server computing, storage, networking, end-user computing, DBMS, email/messaging) and the more mission-specific IT products and services (i.e., business applications and mission-specific systems). This may affect the tools or approaches chosen to support the TBM model, so these considerations should be made and evaluated when sourcing any new products.

[6] Average pay rates are normally used instead of actuals in order to protect specific employee salaries. However, even names, rates, and other figures are sensitive and must be protected.

Recommendation 21. Agency CIOs should implement regular data quality reporting and use the data to continuously mature and enhance the data used for modeling, reporting, and decision making.

Obtaining good data is the most common roadblock to building a good TBM model. Missing or low-quality data can impede accurate allocations, degrade reporting, and impair trust in the model. For this reason, the Commission recommends that agency CIOs implement regular data quality reporting and continuously improve their data to enhance decision making over time.

TBM leaders often struggle with a variety of data quality challenges. They often have trouble getting good data in a timely manner. This is often true when they first create their model or change it. After they have sourced new data for the first time, that process is often easily repeated. In contrast, getting complete datasets[7] with referential integrity tends to be a more persistent problem. To address these challenges, agencies should apply a four-step approach:

1. **Use tools to transform and clean data** of obvious errors and inconsistencies. Tools may be able to correct things like improper formatting without requiring data source fixes. This process often will address a large portion of errors.
2. **Use the model and benchmarking to help identify errors**. Load the data into the model and use (or create) reports to reveal how much of the costs cannot be allocated due to referential integrity issues and gaps in the data. (The right system will provide for data quality reporting.) Also, compare the costs to industry benchmarks; major differences are often caused by gaps in the underlying data.
3. **Fill gaps by using generalized allocation rules**. For example, if the data allows a TBM analyst to accurately allocate 80 percent of a cost pool, they can then spread the remaining 20 percent using weights inferred from the allocated amounts.
4. **Fix source data quality problems over time** by working with data source owners. This process should include not only one-time fixes but also setting standards and procedures to prevent data quality problems from recurring.

Taking these steps to address data quality challenges depends on the TBM system and its processes. Still, agencies must start with the data they have and then work toward gathering (or creating) better data over time. Agency CIOs will never have perfect data, but the very act of modeling and using data will lead to better data — and greater decision-making power — over time.

[7] Referential integrity is essential for using data to drive allocations.

Conclusion

Federal programs increasingly depend on information technologies and new digital capabilities to fulfill their missions. Furthermore, mitigating security risks, improving agility, and increasing program efficiency often depends on modernized systems. Agency leaders and CIOs — and their constituents and stakeholders — can no longer afford to have operations and maintenance spending crowd out development, modernization, and enhancement investments.

FITARA represents a unique opportunity to address this challenge. With broader authority over agency IT spending, agency CIOs are in a much better position to govern their technology resources, improve standardization and consolidation, and leverage shared services and more centralized purchasing power to redirect spending away from O&M toward much needed DME investments.

What stands in the way is a lack of transparency of IT costs, especially O&M spending. The recommendations in this report provide a clear path to creating the insights that are needed for greater efficiency and value. These recommendations were shaped by a discipline called Technology Business Management (TBM) that has been adopted by hundreds of private- and public-sector enterprises.

The Commission recognizes that the solution depends on the collaboration between the OMB and the federal agencies, including the GSA. The best approach includes establishing a reference program and working standards, and refining them over time. As demonstrated by those enterprises that have adopted TBM tools, data, and processes, continuous improvement is a core principle.

It is the hope of the Commission that agency CIOs employ these recommendations to help them take advantage of the opportunity FITARA provides. The Commission's leadership, and the leadership of the TBM Council (including the TBM Council board of directors), stand ready to help and advise agency CIOs as they embark on their TBM journeys.

Appendix A: **Federal TBM Taxonomy**

Taxonomies are generally defined as schemes of classification. And many taxonomies, such as biology or evolutionary taxonomies (think "tree of life"), are hierarchical, showing the relationship of taxonomic ranks. Similarly, the TBM taxonomy classifies and organizes IT costs and other metrics from disparate sources, assets, and services in a hierarchical structure.

The TBM taxonomy provides a means to model IT cost data and other metrics (e.g., power consumption, labor, data center space) in a manner that is consistent with industry peers. This helps not only in building commonality across different sets of data to enable comparisons, but it helps those who are executing their TBM roadmap move forward in a fairly consistent and cost-efficient manner.

Three layers of the taxonomy represent the major steps of translation of costs and other metrics. From the bottom of the taxonomy up these layers are:

- **Finance:** The lowest layer begins with the general ledger, but may include other cost sources unique to the organization. This provides for a standard set of cost pools: hardware, software, internal labor, external labor, facilities/overhead, and outside services. Cost pools not only make cost allocations easier, they enhance reporting because they can be traced through the model to reveal the composition of costs and allow comparability of composition (e.g., how much internal labor is in this service versus that one?).
- **IT:** The middle layer includes a standard set of infrastructure towers and sub-towers, such as servers, storage, voice and data networks, application development and support. These are common amongst nearly all companies and can be viewed as the basic building blocks of specific applications, services, and so on. While the tower definitions are standard, in practice they come in many forms. They may be sourced internally (i.e., via hardware, software, internal labor, and facilities/overhead), largely externally (e.g., outside service, external labor), or as a hybrid of the two. Regardless, this view enables IT leaders to assess the cost-effectiveness of IT technology and service delivery.
- **Business:** At the highest layer the taxonomy provides a standard but generic set of application and service categories along with higher-layer business capabilities. It is at this layer of the model we anticipate the creation of industry-specific elements extending this standard organizing taxonomy and following the same general principles present in the model. This will allow for more meaningful reporting and comparisons within each industry, without losing the cross-industry comparisons that are possible at the other layers via common apps, services, and capabilities. This layer also includes the business unit consumers.

Because the taxonomy enables IT and financial leaders to "bucket" infrastructure, applications, and services into standard categories, it enables discussion of these buckets in terms that make sense — and matter — to business leaders.

The TBM taxonomy is not theoretical; IT cost and resource models based on the TBM taxonomy have been deployed at hundreds of enterprises, including companies as diverse as ExxonMobil, eBay, Nationwide Building Society (UK), and the State of Washington. And because the taxonomy is aligned with the categories and costing methods used by the leading IT benchmarking firms, the TBM taxonomy facilitates apples-to-apples comparisons to industry peers.

The following sections describe and define the finance and IT layers of the TBM taxonomy. These layers are largely generic from one agency to another, although extensions may be made (e.g., adding a tower for Air Traffic Control Systems). The business layer is not defined here,

Finance Layer: Cost Pool and Sub-Pool Definitions

Cost pools are low-level categories that are often aligned easily to general ledger accounts. Not only do pools make cost allocations easier, they enhance reporting because they can be traced through the model to reveal the composition of costs. For example, app TCO can be broken down into hardware, software, internal and external labor, outside services, facilities, and telecom costs.

The following tables define the cost pools and sub-pools in the federal TBM taxonomy. These include both operating and capital expenditures.

Cost Pool	Cost Sub-Pool	Description
Operating Expenditures (OpEx)		
Internal Labor	Expense	Employee wages, benefits, expenses & occupancy.
	Depreciation & Amortization	Depreciation/amortization of any capitalized internal labor; typically, this will show up under Hardware or Software depreciations/amortization
External Labor	Expense	External contractor fees, travel, and expenses.
	Depreciation & Amortization	Depreciation/amortization of any capitalized external labor; typically, this will show up under Hardware or Software depreciations/amortization
Outside Services	Consulting	External consulting project-based services.
	Managed Service Providers	External managed service providers.
	Cloud Service Providers	External public cloud service providers including IaaS, PaaS, and SaaS.
	Depreciation & Amortization	Depreciation/amortization of any capitalized consulting services; typically, this will show up under Hardware or Software depreciations/amortization

Cost Pool	Cost Sub-Pool	Description
Hardware	Expense	Hardware expense of non-capitalized purchases (e.g. spare parts, consumables or equipment below capitalization threshold).
	Lease	Hardware lease expenditures (e.g. hardware purchased through a supplier or financial services leasing arrangement).
	Maintenance & Support	Hardware maintenance and support expenditures.
	Depreciation & Amortization	Hardware depreciation of capitalized purchases.
Software	Expense	Software expense of non-capitalized software purchases.
	Lease	Software lease expenditures.
	Maintenance & Support	Software maintenance and support expenditures.
	Depreciation & Amortization	Software depreciation of capitalized software license purchases & software development efforts.
Facilities and Power	Expense	Data center space, power, security and other operating expenses (e.g. co-location facility services, electricity, water, etc.)
	Lease	Data center lease expenditures.
	Maintenance & Support	Data center maintenance & support expenditures.
	Depreciation & Amortization	Data center depreciation of facility build and leasehold improvements (e.g. raised floor investments, power/PDU infrastructure, rack build-out).
Telecom	Expense	Voice and data network connectivity expenses including circuit and usage expenditures.
	Lease	Telecom lease expenditures.
	Maintenance & Support	Telecom maintenance & support expenditures.
	Depreciation & Amortization	Depreciation/amortization of any capitalized telecom expenditures; typically, this will show up under Hardware or Facilities depreciations/amortization
Other	Other	Miscellaneous or non-standard expenses.
Capital Expenditures (CapEx)		
Internal Labor	Capital	Capitalized labor (internal employees)
External Labor	Capital	Capitalized labor (external contractors)
Hardware	Capital	Capitalized hardware expenditures
Software	Capital	Capitalized software expenditures
Outside Services	Capital	Capitalized services
Facilities & Power	Capital	Capitalized leasehold improvements
Telecom	Capital	Capitalized telecom expenditures

IT Layer: Tower and Sub-Tower Definitions

Towers and sub-towers are the basic building blocks of services and applications. Examples include compute (e.g., servers, Unix, mainframe), network, application (e.g., app dev, app support and maintenance) and IT management. They are sometimes called domains or functions. Many IT shops have dedicated departments or cost centers for towers that are then delivered as shared resources for application and service owners.

The following tables define the towers and sub-towers in the federal TBM taxonomy.

Tower	Sub-Tower	Description
Data Center	Enterprise Data Center	Purpose-built data center facilities that house and protect critical IT equipment including the space, power, environment controls, racks, cabling and "smart hand" support.
	Other Facilities	Computer rooms and MDF/IDF/telco closets that house IT equipment in corporate headquarters, call centers or other general purpose office buildings.
Compute	Servers (Windows)	Physical and virtual servers running a version of Microsoft's Windows Server operating system; includes hardware, software, labor and support services.
	Servers (Linux)	Physical and virtual servers running a version of the Linux server operating system; includes hardware, software, labor and support services.
	Unix	Servers running vendor-specific, proprietary Unix operating systems (e.g. IBM AIX, Sun Solaris, HP UX); includes hardware, software, labor and support services.
	Midrange	Servers running IBM AS/400 platform including hardware, software, labor and support services.
	Converged Infrastructure	Purpose-built appliances that provide compute, storage and network capabilities in one box.
	Database	Distributed database services focused on the physical database (versus the logical design) including DBAs, DBMS, tools and operational support.

Tower	Sub-Tower	Description
	Middleware	Distributed platform, application and system integration resources enabling cross application development, communications and information sharing.
	Public Cloud Compute	Public cloud Infrastructure-as-a-Service (IaaS) compute offerings running any version of Window or Linux server operating system.
	Public Cloud Platform	Public cloud Platform-as-a-Service (PaaS) application development offerings.
	Mainframe	Traditional mainframe computers and operations running legacy operating systems.
	Mainframe Database	Mainframe database services focused on the physical database (versus the logical design) including the DBAs, DBMS, tools and operational support.
	Mainframe Middleware	Mainframe platform, application and system integration resources enabling cross application development, communications and information sharing.
Storage	Distributed Storage	Central storage such as SAN, NAS and similar technologies for the distributed compute infrastructure; includes the equipment, software and labor to run and operate.
	Distributed Tape	Offline storage resources used for archive, backup & recovery to support data loss, data corruption, disaster recovery and compliance requirements of the distributed storage.
	Mainframe Storage	Mainframe attached storage arrays and the associated equipment, software and labor to run and operate.
	Mainframe Tape	Offline storage resources used for archive, backup & recovery to support data loss, data corruption, disaster recovery and compliance requirements of the mainframe storage.

Tower	Sub-Tower	Description
	Public Cloud Storage	Public cloud Infrastructure-as-a-Service (IaaS) storage offerings supporting normal transactional or other operational applications and system.
	Public Cloud Archive	Public cloud Infrastructure-as-a-Service (IaaS) storage offerings for backup and archival purposes.
Network	Data (LAN)	Physical and wireless local area network connecting equipment within the core data centers and connecting end users in office working areas to the agency's broader networks.
	Data (WAN)	Wide area network equipment, labor and support services directly connecting data centers, offices and third parties (excludes telecom and communication services).
	Voice	Voice resources which enable or distribute voice services through on-premise equipment including PBX, VoIP, voicemail and handsets (excludes telecom and communication services).
	Transport (Data)	Data network circuits and associated access facilities and services; includes dedicated and virtual data networks and internet access. Also includes usage associated with mobility and other data transit based on usage billing.
	Transport (Voice)	Voice network circuits and associated access facilities and services. Also includes usage associated with standard telephone calls and 800 number service.
Output	Central Print	Central print services; often provided to support customer billing or customer documentation support processes. Unit of measure: page.
End User	Workspace	Client compute physical desktops, portable laptops, thin client machines, peripherals used by individuals to perform work.

Tower	Sub-Tower	Description
	Mobile Devices	Client compute tablets, smart phones (iOS, Android, Windows Mobile) and apps used by individuals to perform work.
	End User Software	Client related software used to author and collaborate.
	Conferencing & AV	Communication resources that support the collaboration of the workforce through audio and video conferencing technologies.
	IT Help Desk	Centralized help desk resources that handle user requests, answer questions and resolve issues.
	Deskside Support	Local support resources that provide on-site support for moves, adds, changes and hands on issue resolution.
	Public Cloud Desktop	Public cloud Infrastructure-as-a-Service (IaaS) virtual desktop offerings running a personal compute operating system and common utilities.
Application	App Dev	Resources involved with the analysis, design, development, code, test and release packaging services associated with application development projects.
	App Support & Ops	The operations, support, fix and minor enhancements associated with existing applications.
	Line of Business Software	Software expenditures including licensing, maintenance and support related to off-the-shell software purchases.
	Cloud Apps	Public cloud Software-as-a-Service (SaaS) application offerings (e.g. Salesforce.com, ServiceNow, Workday, Apptio).
Delivery	IT Service Management	Resources involved with the incident, problem and change management activities as part of the IT Service Management process (excludes the Tier 1 help desk).
	Project Management	Resources involved with managing and supporting IT-related projects including business and IT-driven initiatives.

Tower	Sub-Tower	Description
	Client Management	Resources or "account managers" aligned with the lines of business to understand business needs, communicate IT products, services and status of IT projects.
	Ops Center	Centralized IT Operations Center resources including monitoring and intervention e.g. NOC (network operations center), GOC (global operations center).
	Public Cloud Ops	Public cloud centralized service management, operations and monitoring services.
Security & Compliance	Security	IT Security resources setting policy, establishing process & means, measuring compliance and responding to security breaches.
	Compliance	IT Compliance resources setting policy, establishing controls and measuring compliance to relevant legal and compliance requirements.
	Disaster Recovery	IT Disaster Recovery resources setting DR policy, establishing process & means, dedicated failover facilities, performing DR testing. NOTE: DR designated equipment is included directly in its own sub-tower (e.g. extra servers for DR are included in Compute tower, etc.).
	Public Cloud Disaster Recovery	Public cloud Infrastructure-as-a-Service (IaaS) on-demand disaster recovery services.
IT Management	IT Management & Strategic Planning	IT management and administration resources; typically CIO, senior IT leaders and administrative support including centralized IT strategy and planning.
	Enterprise Architecture	Enterprise architecture services including business, information, application and technical architecture to drive standardization, integration and efficiency among business technology solutions.

Tower	Sub-Tower	Description
	IT Finance	Resources involved in the planning, budgeting, spend management and chargeback of IT expenditures and the costing of IT products and services.
	IT Vendor Management	Resources involved in the selection, contract management, oversight, performance management and general delivery of services by 3rd party vendors and external service providers.

Business Layer: Services Definitions

Services are what IT delivers to end consumers: agency leaders, end users and often external parties such as partners and constituents. In more mature, service-oriented organizations, services are well defined, advertised in a service catalog, priced or costed, and measured for consumption, among other practices. Service definitions should convey business value to agency leaders, users or other stakeholders.

The following tables define the services in the standard federal TBM taxonomy. They are grouped by type (e.g., end user services, platform services) and then by category (e.g., client computing, communication & collaboration). The following types are included:

- **End User Services** include the client computing devices, software and connectivity to enable the agency's workforce to access business applications; to communicate with other employees, partners and customers; and to create content using productivity software. These are always "user-facing" services.
- **Delivery Services** are those to build, deploy, support and operate the End User Services (above) and Agency Application Services and Shared Application Services (see below). Development services create and change business-facing services, typically through projects. Additional support and operations services assist users, and maintain and ensure the availability of the business-facing services.
- **Infrastructure Services** include the core infrastructure — facilities, compute, storage and network services — that are required to deliver any technology automation. Typically, these are not directly consumed by users. However, for some IT operating models, a shared "infrastructure and operations group" may directly provide these Infrastructure Services to their customers.
- **Platform Services** include the application infrastructure (database, middleware, etc.) that enables business-facing applications and services. Typically, these are not directly consumed by users. They are components required by the end user, agency application and shared application services (see below for the latter two types). However, for some IT operating models, the shared

"infrastructure and operations group" may directly provide these Platform Services to their customers.

There are two other standard types of services that are user-facing for which the specific services are not defined in this report. Instead, the Commission expects each agency and/or a broader standards body (e.g., a government-wide TBM governance board) to define them. These two types are:

- **Agency Application Services** are delivered by IT to enable constituent focused capabilities that enable the agency to serve its constituents.
- **Shared Application Services** are delivered by IT to enable internally focused capabilities to automate and support the organization's internal operations.

Note that many services can be delivered using traditional delivery models (e.g., on-premises data centers) or via different federal cloud delivery models (i.e., Public Cloud, Government Community Cloud, Secret Enclave Cloud and Private Cloud). These are not specifically reflected in the taxonomy categories below as they can apply to many types of services. Furthermore, the standard cloud service models (i.e., Infrastructure as a Service, Platform as a Service, Software as a Service) are not included specifically. However, federal agency TBM models should incorporate those models as classifications (e.g., labels or metadata) where needed for reporting and decision making.

Category	Name	Description
Type: End User Services		
Client Computing	BYOD Activation	A set of services that enable users to bring in their own personal computing devices (laptop, tablet, smartphone) and connect to the agency's network to access business applications, information and other technology resources.
	Desktop	A selection of personal computers or workstations used at a desk or office and not typically moved. May be dedicated to an individual or shared as in a public location or kiosk. Each type may be ordered with additional memory and storage. Standard corporate image will be loaded on each device. Requestor may order optional software through the Content Authoring services. Includes network and remote network access. Standard support package including security, back-up, updates and patches, remote access, centralized help desk.

Category	Name	Description
	Mobile	A selection of laptop or tablet configurations. Each type may be ordered with additional memory and storage. Standard corporate image will be loaded on each device. Requestor may order optional software through the Content Authoring services. Includes network and remote network access. Standard support package including security, back-up, updates and patches, remote access, centralized help desk.
	Virtual Client	The virtualization of desktop and application software enables PC and tablet functionality to be separate from the physical device used to access those functions – whether a fixed or mobile workspace environment. Virtual Workspaces may have different, pre-configured packages of software application and enable access from multiple devices. Advanced desktop management provides higher levels of flexibility, security, backup and disaster recover capabilities.
Communication & Collaboration	Collaboration	A selection of collaborative software offerings that enable people to work together to achieve common goals across locations and time zones.
	Communication	Communication represents a broad set of integrated or individual services that enable users to communicate with other users, partners or customers. This communication may occur via electronic mail, calendaring, messaging, audio conferencing, video conferencing and direct voice calls. More robust, unified messaging provides file transfer, embedded images, clickable hyperlinks, Voice over IP (VoIP) and video chat.
	Print	A variety of peripheral devices that enable the distribution of information. Specialized devices may offer one or all of these services - print, copy, fax. Printing output creates a “hard copy” of digital documents, presentations, spreadsheets, etc. Scan inputs a hardcopy document into a digital format for a computer to use.
	Productivity	End user application software enabling the creation and distribution of information in a variety of formats including: documents, presentations, spreadsheet, databases, desktop publishing, web design, graphics and image editing, audio/video editing and CD/DVD recording.

Category	Name	Description
Connectivity	Network Access	A set of connection services which enable users to access a private or public network from their client computing device. Once connected, as part of the network they can access business applications and information; and can communicate and collaborate with other users on the network.
	Remote Access	A set of connection services which enable users to access the agency's internal private network from their client computing device when away from the corporate facilities. Once connected, the user can access the agency's business applications and information.
Type: Delivery Services		
Development Services	Business Solution Consulting	Business solutions consulting services help the enterprise improve their performance, primarily through the analysis of existing business problems and development of plans for improvement. This may include business process analysis as well as technology selection.
	Design & Development	Design and Development services provide the planning, design, programming, documenting, testing, and fixing involved in creating and maintaining a software product.
	Program & Project Management	Program Management is the process of managing several related projects, often with the intention of improving an organization's performance. Project Management services initiate, plan, execute, control, and close the work of a team to achieve specific goals and meet specific success criteria. A project is a temporary endeavor designed to produce a unique product, service or result with a defined beginning and end (usually time-constrained, and often constrained by funding or deliverables) undertaken to meet unique goals and objectives, typically to bring about beneficial change or added value.
	System Integration	Development services that link together different computing systems and software applications physically or functionally, to act as a coordinated whole. This can be accomplished across systems that reside within the enterprise's data centers as well as with SaaS services that reside in the provider's facilities.

Category	Name	Description
	Testing	Testing services execute a program or application with the intent of finding errors or other defects. The investigations are conducted to provide stakeholders with information about the quality of the product or service and allow the business to understand the risks of software implementation. Testing may take multiple forms including functional, system, integration, performance and usability.
Operations Services	Compliance	IT Compliance services set policy, establish controls and measuring compliance to relevant legal and compliance requirements.
	Configuration	
	Deployment	Includes the release management and software distribution services to deploy new and/or the most recent software version to the host servers or client computing devices.
	Disaster Recovery	IT Disaster Recovery sets DR policy, establishes processes & procedures, may offer shared or dedicated failover facilities, and perform DR testing.
	IT Service Management	IT Service Management refers to the incident, problem and change management services necessary for IT to plan, deliver, operate and control the IT services offered to its customers.
	Monitoring	Service to monitor resources and applications. Service that records API calls and delivers logs and insights.
	Security	IT Security services which set security policy, establish process & controls, monitor compliance to security controls, and respond to security breaches. It includes the protection of information systems from theft or damage of the hardware, the software and the information on them, as well as from disruption or misdirection.
	Usage Analytics	Services that provide log data consolidation, reporting and analysis to enable IT administrators and security personnel to understand asset utilization, user logins, and information access.

Category	Name	Description
Support Services	Application Support	Application Support services provide the ongoing operational activities required to keep the application or service up and running, provide Tier 2 and Tier 3 technical support to more complex or difficulty user questions and requests. Application Support may also include minor the development and validation of smaller application enhancements (e.g. minor changes, new reports).
	Central Print	Central Print services provide high-volume and advanced printing for invoices, product literature or other complex documents for mass distribution. Additional post-print services may include folding, envelope stuffing, postage and bundling to expedite distribution.
	Identity & Access Management	Services related to authentication and authorization. This includes identity, access, key and directory services
	IT Training	IT Training provides educational services to the agency's users on how the access and effectively use the agency's business application services, as well as common productivity software and tools.
	Service Desk	Service Desk provides a single point of contact to meet the communication needs of both users and the IT organization. Help Desk services provide end users with information and support related to IT products and services, usually to troubleshoot problems or provide guidance about products such as computers, electronic equipment, or software. Help desk support may be delivered through various channels such as phone, website, instant messaging, or email.
Type: Infrastructure Services		
Compute Services	Compute on Demand	Offer transient compute services that are executed automatically, either on a schedule or triggered by a pre-define event or set of events.
	Mainframe	Offer transactional and batch oriented compute services supported by a mainframe infrastructure.

Category	Name	Description
	Physical Compute	Offer a variety of compute configurations comprised of physical servers. These are typically distributed compute services based on the Windows or Linux operating systems for pre-defined configurations of memory, CPU and storage. Standard operational support includes security hardening, backup, updates, patches, and centralized monitoring.
	Provision on Demand	Offer a variety of shared compute configurations (typically virtual servers), similar to Shared Compute, but available to be provisioned (and de-provisioned) on-demand manner based on user interaction or the performance of an application itself.
	Virtual Compute	Offer a variety of compute configurations delivered through the virtualization of physical compute resources. These virtual instances are typically running Windows or Linux operating systems and have pre-defined configurations of virtually allocated memory, CPU and storage. Standard operational support includes security hardening, back-up, updates and patches and centralized monitoring.
Data Center Services	Enterprise Data Center Service	Purpose-built facilities to securely house computer equipment providing physical security, clean & redundant power, data connectivity and environmental controls – temperature, humidity, fire suppression.
	Other Data Center Services	Other data center services that may be delivered through rooms or telco closets with a facility.
Network Services	Domain Name Service (DNS)	DNS services provide lookup capabilities to convert domain names (e.g. www.acme.com) into the associated IP address to enable communication between hosts.
	Internet	Telecommunication services using the public internet to enable communications across the agency including its data centers, office buildings, remote locations, partners and service providers. Virtual Private Networks may be created to limit access and provide security.
	Load Balancing	Offer ability to optimize incoming application/workload requests through load balancing and traffic management to deliver high availability and network performance to applications.

Category	Name	Description
	Virtual Private Network (VPN)	VPN services offer a secure method to authenticate users and enable access to corporate systems and information. VPN can also isolated and secure environments in the data center across physical and virtual machines and applications.
	Data Network	A selection of network connection offerings that enable direct data communications across the agency including its data centers, office buildings, remote locations as well as partners and service providers (including public cloud service providers) without traversing the public internet. Typically provides a greater level of performance, security and control.
	Voice Network	Telecommunication offerings based on legacy voice circuits to deliver "plain old telephone service" and other advanced features including 800-services, automatic call distribution, etc.
Storage Services	File Storage	Secure and Durable Object Storage where an object can be unstructured data such as documents and media files or structured data like tables.
	Offline Backup	Secure, durable and extremely low-cost storage for data archiving using offline storage media like tape.
	Online Backup	Secure, durable and extremely low-cost storage for data archiving
	Transactional Storage	Storage services that hold and information for application programs and code.
Type: Platform Services		
Analytic Services	Big Data	Service to process vast amounts of data including big data use cases, including log analysis, web indexing, data warehousing, machine learning, financial analysis, scientific simulation, and bioinformatics.
	Data Pipeline	A set of data analytic services that automate the movement and transformation of data.
	Data Visualization	Software services to communicate information clearly and efficiently to users via graphs, charts and other visual representations. These data visualization services are able to front-end large amounts of data provided by Big Data solutions, Data Warehouses and other data sources.
	Data Warehouse	Service supporting a central repository or set of repositories of integrated data from one or more disparate sources.

Category	Name	Description
	Machine Learning	Service that enables IT consumers to easily build, deploy, and share predictive analytics solutions.
	Stream Analytics	Service to process and analyze real-time streaming data by providing low latency, highly available, scalable complex event processing over streaming data in the cloud.
Application Services	Application Hosting	Fully managed application and web hosting services including the general computing server, database server, web and application server services.
	Notification	A subscribe and publish service for enterprise and mobile messaging.
	Service Bus	Service that processes events to stream to multiple applications.
	Web Services	Standalone Web Service and App Service platform services.
Data Services	Database	A relational database service for applications to access transactional data.
	Distributed Cache	An in-memory cache service that helps improve web application performance.
	NoSQL	A no-sql database service for applications that need consistent, low-latency scaled out document/key-value store models.
	Search	A keyword search service for web and mobile applications.
Media/Content Delivery Services	Distributed Storage	A content delivery web service for high-bandwidth content.
	Live Streaming	Services that deliver live and on-demand media streams.
	On-Demand Video Streaming	Services for premium video streaming workflows.

Appendix B: **Additional TBM Metrics for Federal Agencies**

This appendix provides the list of metrics made possible by employing the TBM taxonomy and TBM model. This first set of recommended metrics, for early phase adoption, represents those that can be implemented with a minimum set of data and process maturity. The second set of metrics are more appropriate for the next level of maturity. Furthermore, the metrics align with the TBM taxonomy layers:

- Cost Pool/Sub-Pool
- IT Tower and Sub-Tower
- Applications & Services
- Business Units

In addition, industry benchmarks are available for all metrics shown below, so agency CIOs can use them to compare their own cost and performance with private- and public-sector peers.

TBM Metrics for Early Phase Adoption

#	TBM Taxonomy Layer	Views/Scope	Metric
1	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Total IT Personnel Count (All towers)
2	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	IT Employee Count (All towers)
3	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	IT Contractor Count (All towers)
4	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Number of users served
5	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Percentage of Spend on Compute
6	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Percentage of Spend on Storage
7	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Percentage of Spend on Network
8	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Percentage of Spend on Data Center
9	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Percentage of Spend on Communications (Telecoms)
10	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Percentage of Spend on End User
11	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Percentage of Spend on Output
12	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Percentage of Spend on Remaining

#	TBM Taxonomy Layer	Views/Scope	Metric
13	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	Percentage of Spend on Application
14	IT Tower/Sub-Tower	IT Towers, High Level Metrics, All	IT Spend per Employee
15	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Employee Percentage of Mainframe Cost
16	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Contractor Percentage of Mainframe Cost
17	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Hardware Percentage of Mainframe Cost
18	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Software Percentage of Mainframe Cost
19	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Services Percentage of Mainframe Cost
20	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Other Costs Percentage of Mainframe Cost
21	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Total annual cost of Mainframe per configured MIPS
22	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Total number of MIPS
23	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Mainframe Utilization (%)
24	IT Tower/Sub-Tower	IT Towers, Mainframe Compute, Mainframe	Number of configured MIPS per FTE for Mainframe
25	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Employee percentage of Servers Cost
26	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Contractor percentage of Servers Cost
27	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Hardware percentage of Servers Cost
28	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Software percentage of Servers Cost
29	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Services percentage of Servers Cost
30	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Other Costs percentage of Servers Cost
31	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Number of Physical servers
32	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Number of Logical servers
33	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Number of Processors
34	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Number of Processor Cores
35	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Logical servers/physical servers

#	TBM Taxonomy Layer	Views/Scope	Metric
36	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Number of processors per physical server
37	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Number of Processor Cores per physical server
38	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Availability (%) during planned uptime
39	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Total annual cost of Servers per physical server
40	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Total annual cost of Servers per logical server
41	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Number of physical servers per FTE for Servers
42	IT Tower/Sub-Tower	IT Towers, Distributed Compute, Servers	Number of logical servers per FTE for Server
43	IT Tower/Sub-Tower	IT Towers, End User, All	Workspace Percentage of EU Cost
44	IT Tower/Sub-Tower	IT Towers, End User, All	Mobile Device Percentage of EU Cost
45	IT Tower/Sub-Tower	IT Towers, End User, All	Field Support Percentage of EU Cost
46	IT Tower/Sub-Tower	IT Towers, End User, All	Virtualized Desktop Percentage of EU Cost
47	IT Tower/Sub-Tower	IT Towers, End User, All	Collaboration Applications Percentage of EU Cost
48	IT Tower/Sub-Tower	IT Towers, End User, All	Email Percentage of EU Cost
49	IT Tower/Sub-Tower	IT Towers, End User, All	Conferencing & A/V percentage of EU Cost
50	IT Tower/Sub-Tower	IT Towers, End User, All	Total annual cost of End User Computing, per workstation (PC, Laptop and Thin Clients)
51	IT Tower/Sub-Tower	IT Towers, End User, All	Total annual cost of End User Computing, per EUC device
52	IT Tower/Sub-Tower	IT Towers, End User, All	Number of EUC devices per FTE
53	IT Tower/Sub-Tower	IT Towers, End User, All	Devices (PCs, Laptops, Smartphone, Thin Clients etc) percentage of EU Cost
54	IT Tower/Sub-Tower	IT Towers, End User, All	Support (Backup/Restore, Moves/Adds/Changes, Office App Support) percentage of EU Cost
55	IT Tower/Sub-Tower	IT Towers, End User, All	End User (Office, Collaboration) percentage of EU Cost
56	IT Tower/Sub-Tower	IT Towers, End User, All	Desktop Printing percentage of EU Cost
57	IT Tower/Sub-Tower	IT Towers, End User, All	Other (Planning & Design, Training, Infrastructure Server Admin, Overheads) percentage of EU Cost
58	IT Tower/Sub-Tower	IT Towers, End User, Workspace	Hardware Percent of Workspace Cost
59	IT Tower/Sub-Tower	IT Towers, End User, Workspace	Software Percent of Workspace Cost
60	IT Tower/Sub-Tower	IT Towers, End User, Workspace	Internal Labor Percent of Workspace Cost

#	TBM Taxonomy Layer	Views/Scope	Metric
61	IT Tower/Sub-Tower	IT Towers, End User, Workspace	External Labor Percent of Workspace Cost
62	IT Tower/Sub-Tower	IT Towers, End User, Workspace	Outside Services Percent of Workspace Cost
63	IT Tower/Sub-Tower	IT Towers, End User, Workspace	Other Costs Percentage of Workspace Cost
64	IT Tower/Sub-Tower	IT Towers, End User, Workspace	Number Desktop PCs
65	IT Tower/Sub-Tower	IT Towers, End User, Workspace	Number Laptop PCs
66	IT Tower/Sub-Tower	IT Towers, End User, Workspace	Number Desktop PCs/per EUC User
67	IT Tower/Sub-Tower	IT Towers, End User, Workspace	Number Laptop PCs/per EUC User
68	IT Tower/Sub-Tower	IT Towers, End User, Mobile Devices	Hardware Percent of Mobile Devices Cost
69	IT Tower/Sub-Tower	IT Towers, End User, Mobile Devices	Software Percent of Mobile Devices Cost
70	IT Tower/Sub-Tower	IT Towers, End User, Mobile Devices	Internal Labor Percent of Mobile Devices Cost
71	IT Tower/Sub-Tower	IT Towers, End User, Mobile Devices	External Labor Percent of Mobile Devices Cost
72	IT Tower/Sub-Tower	IT Towers, End User, Mobile Devices	Number of Smartphones
73	IT Tower/Sub-Tower	IT Towers, End User, Mobile Devices	Number of Tablets
74	IT Tower/Sub-Tower	IT Towers, End User, Mobile Devices	Number of Mobile Devices per Mobile Device FTE
75	IT Tower/Sub-Tower	IT Towers, End User, Field Support	Internal Labor Percent of Field Support Cost
76	IT Tower/Sub-Tower	IT Towers, End User, Field Support	External Labor Percent of Field Support Cost
77	IT Tower/Sub-Tower	IT Towers, End User, Field Support	Outside Services Percent of Field Support Cost
78	IT Tower/Sub-Tower	IT Towers, End User, Virtualized Desktop	Hardware Percent of Virtualized Desktop Cost
79	IT Tower/Sub-Tower	IT Towers, End User, Virtualized Desktop	Software Percent of Virtualized Desktop Cost
80	IT Tower/Sub-Tower	IT Towers, End User, Virtualized Desktop	Outside Services Percent of Virtualized Desktop Cost
81	IT Tower/Sub-Tower	IT Towers, End User, Virtualized Desktop	Number of Virtualized Desktops
82	IT Tower/Sub-Tower	IT Towers, End User, Email	Employee Percentage of Email Cost
83	IT Tower/Sub-Tower	IT Towers, End User, Email	Contractor Percentage of Email Cost
84	IT Tower/Sub-Tower	IT Towers, End User, Email	Software Percentage of Email Cost
85	IT Tower/Sub-Tower	IT Towers, End User, Email	Services Percentage of Email Cost

#	TBM Taxonomy Layer	Views/Scope	Metric
86	IT Tower/Sub-Tower	IT Towers, End User, End User Software	Employee Percentage of End User Software Cost
87	IT Tower/Sub-Tower	IT Towers, End User, End User Software	Contractor Percentage of End User Software Cost
88	IT Tower/Sub-Tower	IT Towers, End User, End User Software	Software Percentage of End User Software Cost
89	IT Tower/Sub-Tower	IT Towers, End User, End User Software	Services Percentage of End User Software Cost
90	IT Tower/Sub-Tower	IT Towers, End User, Conferencing & A/V	Employee Percentage of Conferencing & A/V Cost
91	IT Tower/Sub-Tower	IT Towers, End User, Conferencing & A/V	Contractor Percentage of Conferencing & A/V Cost
92	IT Tower/Sub-Tower	IT Towers, End User, Conferencing & A/V	Hardware Percentage of Conferencing & A/V Cost
93	IT Tower/Sub-Tower	IT Towers, End User, Conferencing & A/V	Services Percentage of Conferencing & A/V Cost
94	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Employee Percentage of Service Desk Cost
95	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Contractor Percentage of Service Desk Cost
96	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Hardware Percentage of Service Desk Cost
97	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Software Percentage of Service Desk Cost
98	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Services Percentage of Service Desk Cost
99	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Other Costs Percentage of Service Desk Cost
100	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Annual Service Desk cost per Service Desk user
101	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Annual Service Desk cost per Service Desk contact
102	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Number of Service Desk Contacts per Week
103	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Number of Service Desk users
104	IT Tower/Sub-Tower	IT Towers, End User, Service Desk	Service Desk Contacts per FTE
105	IT Tower/Sub-Tower	IT Towers, Storage, All	Employee Percentage of Storage Cost
106	IT Tower/Sub-Tower	IT Towers, Storage, All	Contractor Percentage of Storage Cost
107	IT Tower/Sub-Tower	IT Towers, Storage, All	Hardware Percentage of Storage Cost
108	IT Tower/Sub-Tower	IT Towers, Storage, All	Software Percentage of Storage Cost
109	IT Tower/Sub-Tower	IT Towers, Storage, All	Services Percentage of Storage Cost
110	IT Tower/Sub-Tower	IT Towers, Storage, All	Supplies Percentage of Storage Cost
111	IT Tower/Sub-Tower	IT Towers, Storage, All	Other Costs Percentage of Storage Cost
112	IT Tower/Sub-Tower	IT Towers, Storage, All	Total annual cost for Storage per addressable TB of Disk Storage for all

#	TBM Taxonomy Layer	Views/Scope	Metric
			tiers, technologies and sites (including Disaster Recovery)
113	IT Tower/Sub-Tower	IT Towers, Storage, All	Total annual cost of Virtual Tape per TB of data stored on Virtual Tape
114	IT Tower/Sub-Tower	IT Towers, Storage, All	Total annual cost of Automatic Tape Library per TB of data stored on Automatic Tape Library
115	IT Tower/Sub-Tower	IT Towers, Storage, All	Total TB installed Disk (including DR)
116	IT Tower/Sub-Tower	IT Towers, Storage, All	Total TB addressable Disk (including DR)
117	IT Tower/Sub-Tower	IT Towers, Storage, All	Total TB for Automatic Tape
118	IT Tower/Sub-Tower	IT Towers, Storage, All	Total TB for Virtual Tape (including DR)
119	IT Tower/Sub-Tower	IT Towers, Storage, All	Total TB of installed Disk for Virtual Tape
120	IT Tower/Sub-Tower	IT Towers, Storage, All	Addressable TB of Disk per FTE
121	IT Tower/Sub-Tower	IT Towers, Network, Data	Data Percentage of Network Cost
122	IT Tower/Sub-Tower	IT Towers, Network, Data	Annual cost of Data per user
123	IT Tower/Sub-Tower	IT Towers, Network, Data	Thousands of Data (LAN, WAN) Devices per Data FTE
124	IT Tower/Sub-Tower	IT Towers, Network, All	Employee Percentage of Network Cost
125	IT Tower/Sub-Tower	IT Towers, Network, All	Contractor Percentage of Network Cost
126	IT Tower/Sub-Tower	IT Towers, Network, All	Hardware Percentage of Network Cost
127	IT Tower/Sub-Tower	IT Towers, Network, All	Software Percentage of Network Cost
128	IT Tower/Sub-Tower	IT Towers, Network, All	Services Percentage of Network Cost
129	IT Tower/Sub-Tower	IT Towers, Network, All	Other Costs Percentage of Network Cost
130	IT Tower/Sub-Tower	IT Towers, Network, All	LAN/WLAN Percentage of Network Cost
131	IT Tower/Sub-Tower	IT Towers, Network, All	WAN Percentage of Network Cost
132	IT Tower/Sub-Tower	IT Towers, Network, All	Voice Percentage of Network Cost
133	IT Tower/Sub-Tower	IT Towers, Network, All	Other Network Services (security etc) Percentage of Network Cost
134	IT Tower/Sub-Tower	IT Towers, Network, WAN	Annual cost of WAN per connected device
135	IT Tower/Sub-Tower	IT Towers, Network, LAN	Annual cost of LAN per LAN port
136	IT Tower/Sub-Tower	IT Towers, Network, Voice	Annual cost of Voice per Handset
137	IT Tower/Sub-Tower	IT Towers, Network, WAN	Number of WAN devices
138	IT Tower/Sub-Tower	IT Towers, Network, LAN	Number of LAN ports
139	IT Tower/Sub-Tower	IT Towers, Network, Voice	Number of Handsets
140	IT Tower/Sub-Tower	IT Towers, Network, Voice	Number of VoIP handsets
141	IT Tower/Sub-Tower	IT Towers, Network, WAN	Thousands of Connected Devices per WAN FTE
142	IT Tower/Sub-Tower	IT Towers, Network, LAN	Thousands of LAN Ports per LAN FTE
143	IT Tower/Sub-Tower	IT Towers, Network, Voice	Thousands of Handsets per Voice FTE

#	TBM Taxonomy Layer	Views/Scope	Metric
144	IT Tower/Sub-Tower	IT Towers, Communications, All	Telecom Cost of Communications Cost
145	IT Tower/Sub-Tower	IT Towers, Communications, All	Number of users served
146	IT Tower/Sub-Tower	IT Towers, Communications, All	Annual cost of Communications per user
147	IT Tower/Sub-Tower	IT Towers, Output, All	Hardware Percent of Output Cost
148	IT Tower/Sub-Tower	IT Towers, Output, All	Software Percent of Output Cost
149	IT Tower/Sub-Tower	IT Towers, Output, All	Internal Labor Percent of Output Cost
150	IT Tower/Sub-Tower	IT Towers, Output, All	External Labor Percent of Output Cost
151	IT Tower/Sub-Tower	IT Towers, Output, All	Outside Services Percent of Output Cost
152	IT Tower/Sub-Tower	IT Towers, Output, All	Supplies Percent of Output Cost
153	IT Tower/Sub-Tower	IT Towers, Output, All	Central Print Percent of Output Cost
154	IT Tower/Sub-Tower	IT Towers, Output, All	Post Processing Percent of Output Cost
155	IT Tower/Sub-Tower	IT Towers, Output, All	Millions of images processed per month
156	IT Tower/Sub-Tower	IT Towers, Output, All	Annual cost of Output per million images
157	IT Tower/Sub-Tower	IT Towers, Output, All	Number of FTEs for Output per million images
158	IT Tower/Sub-Tower	IT Towers, Management Services, All	Employee Percentage of Management Services Cost
159	IT Tower/Sub-Tower	IT Towers, Management Services, All	Contractor Percentage of Management Services Cost
160	IT Tower/Sub-Tower	IT Towers, Management Services, All	Hardware Percentage of Management Services Cost
161	IT Tower/Sub-Tower	IT Towers, Management Services, All	Software Percentage of Management Services Cost
162	IT Tower/Sub-Tower	IT Towers, Management Services, All	Services Percentage of Management Services Cost
163	IT Tower/Sub-Tower	IT Towers, Management Services, All	Other Costs Percentage of Management Services Cost
164	IT Tower/Sub-Tower	IT Towers, Management Services, All	Total annual cost of Management Services per user
165	IT Tower/Sub-Tower	IT Towers, Management Services, All	Number of FTEs for Management Services per thousand users

TBM Metrics for Later Phase Adoption

#	TBM Taxonomy Layer	Views/Scope	Metric
1	Business Units	Business Unit	Total Spend
2	Business Units	Business Unit	Total Run Spend
3	Business Units	Business Unit	Total Change Spend
4	Business Units	BU, Business Unit Portfolio View	% of IT Spend
5	Business Units	BU, Individual Business Unit	% of IT spend
6	Business Units	BU, Individual Business Unit	% change in spend, year-over-year
7	Business Units	BU, Individual Business Unit	% spend by service
8	Business Units	BU, Individual Business Unit	IT spend per person
9	Applications & Services	Services, Service Portfolio	Total Spend
10	Applications & Services	Services, Service Portfolio	Service Run Spend
11	Applications & Services	Services, Service Portfolio	Service Dev Spend
12	Applications & Services	Services, Service Portfolio	# Services, % Change YTD
13	Applications & Services	Services, Service Portfolio	% by Compute Virtualization Profile
14	Applications & Services	Services, Service Portfolio	% by Compute Environment
15	Applications & Services	Services, Service Portfolio	% by Storage Tier
16	Applications & Services	Services, Service Portfolio	% by Storage Environment
17	Applications & Services	Services, Service Portfolio	% by Service Desk Ticket Type
18	Applications & Services	Services, Service Portfolio	% by Service Desk Ticket Severity
19	Applications & Services	Services, Individual Service	Total Spend
20	Applications & Services	Services, Individual Service, Service Run Spend	By IT Tower & IT Sub-Tower
21	Applications & Services	Services, Individual Service, Service Run Spend	By Cost Pool & Cost Sub-Pool
22	Applications & Services	Services, Individual Service, Service Run Spend	Servers: By Virtualization Profile, By Class, By Environment, By Platform, By Location
23	Applications & Services	Services, Individual Service, Service Run Spend	Storage: By Tier, By Environment, By Platform, By Location
24	Applications & Services	Services, Individual Service, Service Run Spend	Service Desk Tickets: By Category, By Impact, By Location
25	Applications & Services	Applications	Average Unit Costs
26	Applications & Services	Applications, Application Portfolio	Total Spend
27	Applications & Services	Applications, Application Portfolio	App Run Spend
28	Applications & Services	Applications, Application Portfolio	App Dev Spend
29	Applications & Services	Applications, Application Portfolio	% by Compute Virtualization Profile
30	Applications & Services	Applications, Application Portfolio	% by Compute Environment
31	Applications & Services	Applications, Application Portfolio	% by Storage Tier

#	TBM Taxonomy Layer	Views/Scope	Metric
32	Applications & Services	Applications, Application Portfolio	% by Storage Environment
33	Applications & Services	Applications, Application Portfolio	% by Service Desk Ticket Type
34	Applications & Services	Applications, Application Portfolio	% by Service Desk Ticket Severity
35	Applications & Services	Applications, Individual Application	Total Spend
36	Applications & Services	Applications, Individual Application	App Run Spend
37	Applications & Services	Applications, Individual Application, App Run Spend	App Run Spend By IT Tower & IT Sub-Tower
38	Applications & Services	Applications, Individual Application, App Run Spend	By Cost Pool & Cost Sub-Pool - benchmarkable
39	Applications & Services	Applications, Individual Application, App Run Spend	Servers: By Virtualization Profile, By Class, By Environment, By Platform, By Location
40	Applications & Services	Applications, Individual Application, App Run Spend	Storage: By Tier, By Environment, By Platform, By Location
41	Applications & Services	Applications, Individual Application, App Run Spend	Service Desk Tickets: By Category, By Impact, By Location
42	IT Tower/Sub-Tower	IT Towers	Total Spend IT Tower
43	IT Tower/Sub-Tower	IT Towers	Total Spend IT Sub-Tower
44	IT Tower/Sub-Tower	IT Towers	Unit Quantities
45	IT Tower/Sub-Tower	IT Towers	Average Unit Costs
46	IT Tower/Sub-Tower	IT Towers	% Volume Change
47	IT Tower/Sub-Tower	IT Towers	% Unit Cost Change
48	IT Tower/Sub-Tower	Public Cloud	Total Spend
49	IT Tower/Sub-Tower	Public Cloud	Total Volumes
50	IT Tower/Sub-Tower	Public Cloud	Average Unit Costs
51	IT Tower/Sub-Tower	Public Cloud	% Public Cloud Spend
52	IT Tower/Sub-Tower	Public Cloud	% Change Public Cloud Spend
53	Cost Pool/Sub-Pool	Labor	Total Spend
54	Cost Pool/Sub-Pool	Labor	Headcount
55	Cost Pool/Sub-Pool	Labor	Labor Cost as % of IT Spend
56	Cost Pool/Sub-Pool	Labor	% Internal vs. External

Appendix C: **IT COST Commission Work Streams**

To accelerate the analysis and recommendations from the IT COST Commission members, the Commission initiated four (4) work streams, each focused on adapting different aspects of TBM to federal IT management and procurement environments.

1. **Federal IT Cost Taxonomy:** The purpose of this work stream was to define a common cost and resource taxonomy for all federal IT cost reporting, including O&M and DME spending. In doing so, this work stream achieved the following goals:

   - Provide a common categorization of IT costs that facilitates aggregation and analysis across the individual cost categories at each level of the taxonomy
   - Enable comparisons across federal agencies and commercial entities

   As a result, this work stream delivered a recommended federal IT cost taxonomy based on the standard TBM taxonomy where applicable.

2. **Investment View Framework:** The purpose of this work stream was to leverage the TBM taxonomy during the investment definition and request process. This work stream achieved the following goals:

   - Compare and track investment costs by spend category and type across agencies
   - Aggregate the non-recurring and O&M demand by functional categories, infrastructure towers, vendor and cost pool categories resulting in a transparent view of technology demand

   This work stream delivered recommendations for standard investment request template(s) and cost models that group cost by category on the IT taxonomy, tailored to major request types.

3. **Financial View Framework:** This work stream sought to understand aggregated cost and the colors of money of IT capabilities and supporting services. It achieved the following:

   - Understand primary drivers of IT cost within and across federal agencies to drive efficiency
   - Uncover duplicative systems, contracts, and processes
   - Easily map costs to existing financial systems

   As a result, this work stream delivered recommendations for a federal IT financial reporting framework including standard reports and key metrics. It also delivered recommendations for aggregate reporting to the OMB along with recommendations for annual benchmarks.

4. **Federal Policy and Data Requirements:** This work stream summarized federal policies, standards, and data and reporting requirements related to IT costs. Its purpose was to ensure the other work streams meet the other federal requirements (e.g., Clinger-Cohen Act, DATA Act, OMB Circular A-11). In turn, it provided a list of policies and requirements relevant to those work streams.