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Of

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Introduction

Chairman Harper, Ranking Member Brady, and members of the committee, thank you for the opportunity to testify today on information technology (IT) challenges at the Library of Congress and on the Library's progress in addressing them.

The Office of the Inspector General (OIG) first identified the IT area as a "Top Management Challenge" in our 2011 Semiannual Report to Congress and has consistently reported on IT challenges since that time.

I have been the Inspector General since the summer of 2014 and, under my direction, the OIG has emphasized that robust strategic planning is essential for the Library to efficiently and effectively manage IT and fulfill its mission.

We all recognize that an agency of the magnitude and importance of the Library, whose very essence involves collecting and conveying information, cannot succeed in the information age without a highly functioning, efficient, and leading edge digital infrastructure. This necessarily includes a knowledgeable and adept IT management group seamlessly interacting and advising Library senior management in developing and maintaining efficient systems that deliver desired services to all customers. Recent changes made at the senior-most levels in both the Library's IT management and executive leadership have facilitated more productive interactions between these groups and have helped to set the foundation for a stable and efficient IT infrastructure.

Backdrop: 2009 findings

To understand the basis for my assessment, it is important to understand the background on which it is based. On April 29, 2009, my predecessor testified before this committee about a then-recently completed OIG performance audit[1] on the Library's management of IT infrastructure investments. The audit examined (1) whether the Library's IT strategic plan aligned with its overall strategic plan; (2) the validity and integrity of the IT strategic plan; and (3) the appropriateness and effectiveness of the Library's IT organizational structure and placement.

The OIG's 2009 audit report had findings in the following areas:

1. Strategic Planning Process: The planning process was not inclusive of all internal stakeholders, and the policy assigning responsibility for strategic planning was not clear. The Library's IT strategic plan also did not align well with its overall strategic plan, was not a unifying force at the

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[1] *Information Technology Strategic Planning: A Well Developed Framework is Essential to Support the Library's Current and Future IT Needs*, 2008-PA-105, March 2009.

Library, and was not incorporated into the organization's culture. One significant result was that the Library's digitization efforts were unfocused.

2. <u>IT Investment Process</u>: The Library did not evaluate spending decisions as a whole, as part of a capital asset planning and investment process and as part of a strategic planning process that considered spending decisions in relation to accomplishing the Library's mission. Management also did not conduct a cost/benefit analysis of alternatives on a consistent basis, evaluate the return on IT investments, or properly track IT costs, the effect of which resulted in the lack of transparency on IT costs that resulted in efforts and purchases of IT hardware and services that were uncoordinated and duplicative. Although there were some success stories, in the absence of an effective investment process, success was often difficult to repeat, and the Library was years behind other federal agencies in its IT capital investment processes and IT project management disciplines.

3. <u>Organizational Structure</u>: The organizational structure of the IT function did not foster strategic planning and good IT governance. For example, the Chief Information Officer (CIO) was not given the authority to make Library-wide decisions on IT governance, capital planning, and asset management.

4. <u>Enterprise Architecture</u>: The Library did not have an enterprise architecture program for planning future technology. There was no proper mapping of the Library's IT infrastructure, nor was there an informed process for projecting a "to be" state to help prevent duplication of efforts. There were also costly iterations of systems to support business applications and incompatible vendor hardware. As a result, the Library's ability to identify system interfaces was diminished along with experiencing limitations for economies of scale.

5. <u>Customer Service</u>: There were significant customer service problems, many of which were not addressed by IT management because the Library did not employ quality assurance mechanisms, such as service-level agreements and performance metrics.

The Inspector General opined in his testimony that these findings resulted in large part from Library management not understanding how IT strategic planning would help achieve the Library's mission and from Library employees not knowing their IT-related roles and responsibilities, as well as from IT planning being disconnected from evaluations of actual IT performance. Library employees needed to understand how IT planning impacted the Library's ability to accomplish customer goals and objectives. In all, the report presented 26 recommendations spanning all five topic areas.

Change between 2009 and 2015 was slow

Using good IT management practices as criteria, the 2009 report demonstrated that Library leadership at the time was well behind in understanding, implementing, and maintaining efficient and effective IT operations in the information age. In the subsequent five years, the Library made only incremental progress in the key areas identified in the report. Just as important, the Library's IT function was not

effectively aligned within the organization, and there was little progress on the critical issue of developing a Library-wide digital collections strategy.

In December 2014, the Government Accountability Office (GAO) initiated a statutorily-mandated audit of the Library's IT operations[2] along with an in-depth review of the Copyright Office's IT operations.[3] Like the OIG, GAO identified weaknesses at all levels.[4] In March 2015, the OIG delivered the first[5] of seven reports[6] over the next two years focused on the Library's IT management policies and practices, strategic approach, and digital collections efforts. Each of the reports reiterated and expanded upon the findings and recommendations made by the OIG's 2009 audit.

Significant changes since 2015

In 2015, to address OIG and GAO recommendations, the Library made three fundamental changes that overhauled the organization, management, and operation of the Library's IT function. This paved the way for the Library to dramatically improve the effectiveness of IT services and become more strategically prepared for the 21st century.

First, in May 2015, the previous Librarian of Congress announced the disbandment of the old organizational structure, created a stand-alone Office of the Chief Information Officer (OCIO), and inserted a temporary CIO to immediately begin addressing operational weaknesses and audit recommendations. The CIO position was established as the agency-wide officer in charge of all IT planning, capital investments, policies, and enterprise architecture decisions.

Second, in September 2015, following a nationwide search, Library management hired Mr. Barton to serve as the Library's first professional CIO and lead the Library's IT reformation. Hiring the Library's first-ever, technically qualified, experienced CIO was an important, positive step.

And third, in November 2016, Dr. Carla Hayden, as the new Librarian, shifted the lines of reporting so that the CIO now reports directly to her instead of to the Chief Operating Officer. This not only puts the CIO position in line with statutory requirements for the executive branch, it also makes the position one of the most senior in the Library. Elevating the position is significant because it gives the CIO recognition as a Library-wide strategic and operational partner, having both roles is critical for him to be effective.

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[2] GAO, *Library of Congress Needs to Implement Recommendations to Address Management Weaknesses*, GAO-16-197T.

[3] GAO, *Copyright Office Needs to Develop Plans that Address Technical and Organizational Challenges*, GAO-15-338.

[4] GAO found that the Library did not have an IT strategic plan that is aligned with the overall agency strategic plan and establishes goals, measures, and strategies; the Library was not effectively managing its investments; the Library did not have a complete process for tracking its IT spending or an accurate inventory of its assets; the service units were often not satisfied with the IT service they were receiving, which contributed to their independently pursuing their own IT activities; and the Library did not have the leadership needed to address these IT management weaknesses.

[5] *Report on the Design of Library-wide Internal Controls for Tracking Information Technology Investments*, 2014-IT-101, March 2015.

[6] *The Library Needs to Determine an eDeposit and eCollections Strategy*, 2014-PA-101, April 2015; *Benchmarking the Library of Congress Information Technology Fiscal Year 2014 Budgetary Obligations and Human Capital*, 2015-IT-101, March 2016; *FY 15 Review of Server Configurations of Tier 1 Systems: Summary Report*, 2015-IT-103; August 2016; *July 2016 Disaster Recovery Exercise Review,* 2016-IT-101, February 2017; *FY 2016 Review of Systems Development Life Cycle*, 2016-IT-102, February 2017; *Analysis of Library of Congress IT Storage Infrastructure,* 2015-IT-104, March 2017.

The importance of these developments cannot be overstated. Before their implementation, the Library's IT group was struggling.

Upon his arrival, Mr. Barton assumed the daunting task of addressing basic gaps that many executive branch agencies tackled ten or more years ago and implementing over a hundred recommendations made by OIG and GAO to bring the Library in line with standards. He is appropriately approaching the situation with deliberate speed, which I applaud, and, under his direction, the Library is making notable progress in the IT area for the first time. Mr. Barton inherited 145 OIG recommendations of which he has cleared 33. Going forward, our focus will be to monitor implementation-related issues and not create additional recommendations at the macro-level.

The CIO's imperatives

The CIO has operational and strategic imperatives to address, but to make fundamental changes and improvements over the short-term (3-year) he needs to build a team with the right mix of qualified full-time equivalents and contract support. The CIO has taken significant, positive steps in this regard. His Deputy CIO is a distinguished, qualified, and effective IT executive with over twenty years of Library of Congress experience. He has also begun to hire highly qualified and technologically experienced managers within the system engineering, contingency planning and disaster recovery, and data center operations areas. Additionally, as we have advised the Librarian and the CIO, he will need contract support to backstop for critical gaps.

To adequately and consistently deliver IT services, the Library has acted to address multiple challenges in IT governance and performance issues that have been highlighted by the OIG, including:

- Initiating a step-by-step analysis of all Library IT governance programs. The goal is an integrated IT governance program that incorporates the 1996 Clinger-Cohen Act, as appropriate, in which all IT proposals are evaluated for consistency with strategic direction, reviewed by the appropriate governance structures, and tracked through to completion.
- Implementing an IT capital plan covering both developmental projects and infrastructure. The capital plan will become a multi-year planning tool that incorporates Office of Management and Budget's (OMB) requirements for executive branch agencies as appropriate. It will also be integrated with the Library's strategic, tactical, and budget planning processes. The governance structure will ensure integration with these and other governance components.
- Linking strategic planning, budgeting, and financial accounting to ensure that the Library's IT Steering Committee can effectively support the IT investment management, enterprise architecture, and information resource management processes. This includes incorporating variance tracking as a Library-wide governance mechanism as well as pursuing other cost accounting and historical IT cost analyses.
- Collaborating with service units on meeting their respective mandates and seeking integration at key governance points, and assuring sufficient senior management oversight.
- Centralizing and enhancing cybersecurity, including two-factor identification.

- Conducting the first contingency planning failover testing to the Alternative Computing Facility (ACF) for multiple Library critical systems.
- Drafting a comprehensive overhaul of Library IT policies to properly institute IT investment management/capital planning investment control (ITIM/CPIC) compliance.
- Establishing service-level agreements, maintaining software and hardware patches, and other standard operating functions.

Challenges remain for the Library: Primary Computing Facility and Strategic Planning

Recognizing that significant progress has been made, challenges remain that will complicate efforts to accomplish a well-functioning IT environment. One such challenge is moving to an adequate Primary Computing Facility (PCF), and another is improving the Library's enterprise-wide strategic plan.

The OIG reported in March 2017 that the PCF has had significant issues over the last several years and has not adequately kept up with demand.[7] We learned that power utilization is at or near maximum capacity in its current state, requiring significant work-arounds that increase risk. High rates of IT storage growth will increase the burden on OCIO technical staff and on physical PCF and ACF components, such as power, cooling, and floor space. Congress has acted by providing initial funding for the new facility, which enables positive changes, but the build-out will take time and considerable effort.

Hiccups may occur while the Library is still operating at the current PCF. While planning the new PCF, the CIO will also have to address various hardware and related infrastructure needs, including those related to maintaining current business operations and growing capacity in the short-term, and intensify the OCIO's contingency planning.

Further, work remains to increase the ACF's capacity to avoid having a significant contingency event that creates a prolonged disruption in the delivery of services to stakeholders and customers. Adequate testing of disaster recovery capabilities had not been enforced at the Library until recently, making it unclear how the ACF would perform. Without a formalized testing model for disaster recovery that is directed from a strategic level and managed consistently across systems, the Library has lacked the foundation to fully validate recovery capabilities and demonstrate readiness. The CIO is making progress in this area and has started testing more comprehensively. A full test needs to be done, however. This testing also needs to happen on a regular basis, as outlined in the Library's Security Directive. The CIO and agency heads should report on the results of the testing to the Librarian, ensuring compliance with the directive's requirement and satisfying the responsibility of both the CIO and the Librarian.

To effectively identify the PCF's needs, the CIO also needs to define the Library's "to be" enterprise architecture and infrastructure; additional funding from a variety of sources may be required to support this initiative and its timing. The direct benefit is a greater return on the Library's existing enterprise storage investment, enhanced cybersecurity protection of data, and increased data availability. This all

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[7] *Analysis of Library of Congress IT Storage Infrastructure*, 2015-IT-104, March 2017.

results in improved key stakeholder satisfaction and accurate management decisions aligned with the business financial/budgetary needs and technology performance/functional requirements.

More robust strategic planning is needed

I want to get back to the other imperative for the CIO, IT strategic planning, because it is the crux of what has the potential to make or break the Library's success in the digital age. But we can't talk about IT strategic planning without first addressing strategic planning for the Library as a whole, so I will address the Library's strategic planning initiative first.

As we have said in our reports, it is critical and time-sensitive for the Librarian and all Library executives to create a strong enterprise-wide strategic plan and implement it in a deliberate and timely manner. Historically, many of the Library's management challenges have flowed from a lack of proper strategic planning and performance management.

The Library should develop a more robust strategic planning framework that establishes strategic goals with specific and aggressive outcomes in which it measures its performance with valid and verifiable performance metrics. This involves ensuring that strategic plans—from the Library's enterprise-wide strategic plan to all of its supporting subordinate strategic plans—seamlessly align to maximize coordination and reduce redundant requests for resources.

The Library's current enterprise-wide strategic plan for FYs 2016-2020 was created to be a "living" plan, intended to guide the Library during a time of leadership transition and be revised once a new Librarian arrived. Along these lines, Dr. Hayden has expanded the Library's planning and performance improvement activities and, with the recent launch of a Library-wide envisioning initiative,[8] is moving towards developing a Library-wide strategic plan supported by aligned service unit plans. The key will be to have a full set of priorities for the Library by the end of the fiscal year and aggressively start to implement them in 2018.

First and foremost, the Library should prioritize identifying and addressing the needs of customers as part of strengthening its strategic planning and performance management since it has no comprehensive data on customers' needs, feedback, and experience and currently has no effort to collect such data on an on-going basis. The Library must develop a better understanding of its customers by obtaining comprehensive and reliable customer satisfaction data, defining its intended customer experience, and then addressing the customer experience in its strategic plan. The Library needs to know how its services look and feel from its customers' perspectives, whether they are members of Congress receiving Congressional Research Service reports, customers of the Copyright Office, or academic researchers delving into the Library's collection materials. Having done this, the Library must then employ its strategic planning and performance management framework to measure performance and identify adjustments needed to improve customer services and related service unit performance.

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[8] The Library's initiative, Envisioning 2025, launched in May 2017. According to the Library, it is "designed to inform the Library's direction and vision for the future and set clear priorities to guide how the institution moves forward to that future." The Library of Congress Gazette, June 2, 2017.

Until these issues are addressed, the Library's IT strategic planning will lack the necessary direction and focus. For example, initiating a digital collections strategy is critical to the Library's success in collecting digital materials and to the Library achieving its desired position as a leader in the digital collections arena. However, in the absence of the enterprise-wide strategic plan spelling out digital services and collections objectives, responsibilities, etc., several units within the Library are creating digital collections strategies and requesting resources for implementation. This situation has made the Library vulnerable to the risks of duplication of efforts and acquisitions, as highlighted in our 2009 report on IT Strategic Planning.

Further, the Library's eDeposit program, a digital collections initiative implemented in 2010, serves as a warning of what can go wrong in the absence of proper planning and implementation. As outlined in our April 2015 eDeposit audit report, the OIG could not determine whether progress made after five years of effort had met management's expectations because Library leadership had not established quantifiable expectations related to cost, performance, and project completion; the Library described its progress as "incremental." The audit also highlighted other issues, such as the Library's inability to monitor significant IT investments across its planning, budgeting, program/project management, and financial accounting systems. Further, without better project management practices, the OIG concluded that digital collections initiatives will be at an increased risk of failure. The OIG also identified the need to take into account the unique requirements and business needs of the Copyright Office. For example, the Library needs to ensure that electronic works transferred by the Copyright Office from copyright registration or mandatory deposit for the Library's collections are protected from unauthorized copying and sharing.

As noted previously, the CIO has hired capable IT professionals, however we believe the Library does not have the specialized knowledge, skills, and abilities to create a fully comprehensive digital services strategy and implementation plan. Such a strategy must incorporate an overview of what the Library currently has in its digital collections, what it ingests, how it is processed and stored, and how it interacts with the consumer. It is our belief that the Library must engage a highly experienced firm to develop and help implement an overarching digital services strategy and successful collection effort. Because of the lack of progress, getting such a plan in place should be a top priority. Expert guidance will ensure that the strategy appropriately coordinates the collection policy requirements of the Library and Copyright along with the technological framework required to manage and sustain digital collections data.

Overlaying all of this, senior-most leadership must institute an oversight process that incorporates planning, performance management, and reporting processes into significant decision-making; continually monitors and holds service units accountable for performance variances; and analyzes and corrects performance shortfalls on a real-time basis. Implementing such an ongoing oversight process will motivate service units to deliver strategic results. Without such a methodical approach led by senior management, strategic planning and performance management will not obtain the desired results. Recognizing this organizational weakness, the Deputy Librarian prior to Dr. Hayden's arrival, established the new position of Senior Advisor for Organizational Performance filling it with an executive having extensive corporate and organizational experience in strategic planning and performance management.

At this time that position reports directly to Dr. Hayden, providing strategic planning and the required organizational positioning and tone necessary to signify its importance to everyone at the Library. The Library also recently began a design and launch of an integrated enterprise-wide risk management framework, in keeping with OMB Circular A-123. It will be important for the Library to follow-through in FY 2018 to ensure that this work quickly informs the revision of existing strategic plans.

IT Strategic Planning has improved

The Library's and the OCIO's imperatives are intertwined; to adequately develop the IT plan, the CIO needs a fully formed enterprise-wide strategic plan that identifies and addresses customer needs and an associated digital services strategy. As of March 31, 2017 OCIO issued an updated version (1.2) of *The Library of Congress IT Strategic Plan for FYs 2016-2020*. Its four strategic goals include (1) Provide strategic direction and leadership; (2) Improve IT Investment Management; (3) Deliver business-driven capabilities; and (4) Strengthen protections for systems and information. Our seven IT audits over the last two years[9] identified a number of significant deficiencies prohibiting the OCIO from accomplishing these strategic goals. Importantly, under the direction of the CIO, the Library must improve its IT governance framework and internal controls. The IT Steering Committee, Architecture Review Board, Executive Committee, Strategic Planning and Performance Management Office, and the Budget Office must understand, exercise, and improve their participation in directing, coordinating, and achieving strategic IT results. For too long, these governance mechanisms have been weak and the members were not fully exercising their roles in delivering IT strategic results. Those governance bodies and the incumbent executives need to provide more muscular leadership in an effort to quickly move toward closing the Library's gaps in systems, best practices, and effective IT management.

The updated IT strategic plan is an improvement, but the plan should emphasize the following areas:

- Fill the knowledge and capabilities gaps by developing a human capital plan to obtain the right knowledge, skills, and abilities for all IT positions;
- Implement a performance planning apparatus that deliberately and methodically drives strategic planning monitoring and accomplishments similar to our recommendation above for Library-wide strategic planning oversight;
- Enhance the Library's fiscal framework for managing IT investments including the internal controls as well as the linkages between the agency's stakeholders, agency strategic plans, and budget planning for capital investments; and
- Improve the fiscal framework for the capital planning and investment process to ensure it identifies the complete costs of projects and ensures that the Library adequately plans, selects,

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[9] *Report on the Design of Library-wide Internal Controls for Tracking Information Technology Investments*, 2014-IT-101, March 2015; *The Library Needs to Determine an eDeposit and eCollections Strategy*, 2014-PA-101, April 2015; *Benchmarking the Library of Congress Information Technology Fiscal Year 2014 Budgetary Obligations and Human Capital*, 2015-IT-101, March 2016; *FY 15 Review of Server Configurations of Tier 1 Systems: Summary Report*, 2015-IT-103; August 2016; *July 2016 Disaster Recovery Exercise Review*, 2016-IT-101, February 2017; *FY 2016 Review of Systems Development Life Cycle*, 2016-IT-102, February 2017; *Analysis of Library of Congress IT Storage Infrastructure*, 2015-IT-104, March 2017.

manages, and evaluates its IT investments to maximize its return on investment and minimize risk.

For the IT strategic plan to be fully responsive to the Library's needs, the input of the Library's envisioning initiative also needs to be incorporated into the enterprise-wide strategic plan and then taken into account for the IT strategic plan. The Library's IT strategic plan must facilitate a coordinated and integrated approach to addressing the Library's needs, such as managing business operations and collections data. For efficiency, the CIO needs this guidance to construct a digital infrastructure that accommodates the Library's diverse needs.

For example, our *IT Storage Infrastructure* report[10] found that a significant amount of groundwork needs to be done in order to achieve a better strategic, cost-effective, long-term storage objective, to not only improve resource allocation but also to provide better insight for total infrastructure utilization and future planning. Without a coordinated and organization-wide plan to manage its storage requirements, the Library will face enormous and wasteful storage costs complicated with multiple vendors, unsupported technologies, and multiple unnecessary platforms. Recognizing the unique needs of the Library related to its significant and ever growing digital collections, it must develop storage strategies that make use of the various available storage alternatives including owned infrastructure, public clouds, internal clouds, and third party repositories. In the face of limited budgetary resources it is fundamentally important that the Library obtain economies of scale from an effective IT strategic approach that focuses on shared services for all of its digital needs.

In conjunction with the aforementioned activities, the Library needs to implement greater cost controls. At the time of GAO's audit[11] of the Library's IT operations, it had difficulty determining the Library's annual IT expenditures. OIG's Audit Report No. 2016-IT-102, *FY 2016 Review of Systems Development Life Cycle*, found significant issues in accounting for the Library's IT capital investments. We have stated in various reports that improvement opportunities exist for capturing and reporting full-time employee costs related to specific development projects. Internal software development costs can often consume significant human capital resources, and the inability to accurately capture and track such costs will make it difficult to identify project development cost overruns. This inability also makes it more likely that Library resources will be wasted. System development success should be evaluated continuously based on whether projects are being delivered as designed, on time, and at or below budgeted costs.

The Library also needs to improve its tracking of IT costs to adequately validate IT efficiencies, practice effective project management, and demonstrate a project's return on IT investment. Just as importantly, it needs reliable historical IT financial accounting data to effectively demonstrate sound custody of its IT budgetary resources or make convincing requests for IT budgetary initiatives.

Currently, OCIO has taken the initiative to develop a methodology to collect historical IT financial data, establish a framework for the Library's IT Capital Planning and Investment Control process, and formulate its basis for cost management. However, given the responsibilities related to managing

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[10] *Analysis of Library of Congress IT Storage Infrastructure*, 2015-IT-104, March 2017.
[11] GAO, *Library of Congress Needs to Implement Recommendations to Address Management Weaknesses*, GAO-16-197T

financial data, the Chief Operating Officer and Chief Financial Officer should take leading roles in establishing the CPIC process and developing the capability to collect and report reliable IT financial data.

Great challenges lie ahead for the Library. The CIO must develop best IT practices, implement effective strategic planning, and institute sufficient planning, budgeting, and accounting practices. Despite these challenges, in less than two years, the CIO and his deputy have established the proper tone and demonstrated initial progress in overcoming them. The new Librarian's challenge will be to zero in on strategic planning and timely implementation. When they address these issues, we believe the Library will make tremendous progress.

Acronyms Used

ACF	Alternative Computing Facility
CIO	Chief Information Officer
CPIC	capital planning investment control
GAO	Government Accountability Office
IT	information technology
ITIM	IT investment management
OCIO	Office of the Chief Information Officer
OIG	Office of the Inspector General
OMB	Office of Management and Budget
PCF	Primary Computing Facility