United States Government Accountability Office

Report to Congressional Committees

September 2022

CHIEF INFORMATION OFFICERS

Private Sector Practices Can Inform Government Roles

Accessible Version

GAO-22-104603

GAO Highlight

Highlights of GAO-22-104603, a report to congressional committees

September 2022

CHIEF INFORMATION OFFICERS

Private Sector Practices Can Inform Government Roles

Why GAO Did This Study

Over the years, Congress has enacted various laws in an attempt to improve the government's management of IT. GAO has previously reported on the challenges faced by federal agency CIOs.

GAO was asked to review the extent of alignment among the responsibilities of federal agency CIOs, their private sector counterparts, and the overall Federal CIO located in the Office of Management and Budget. This report examines (1) the responsibilities of selected CIOs in the private sector and how they compare to the responsibilities of federal agency CIOs; (2) the qualifications and tenure of selected CIOs in the private sector; (3) how the responsibilities of the Federal CIO compare with those of federal agency and private sector CIOs; and (4) how private sector CIO experiences can be applied to the challenges facing federal agency CIOs.

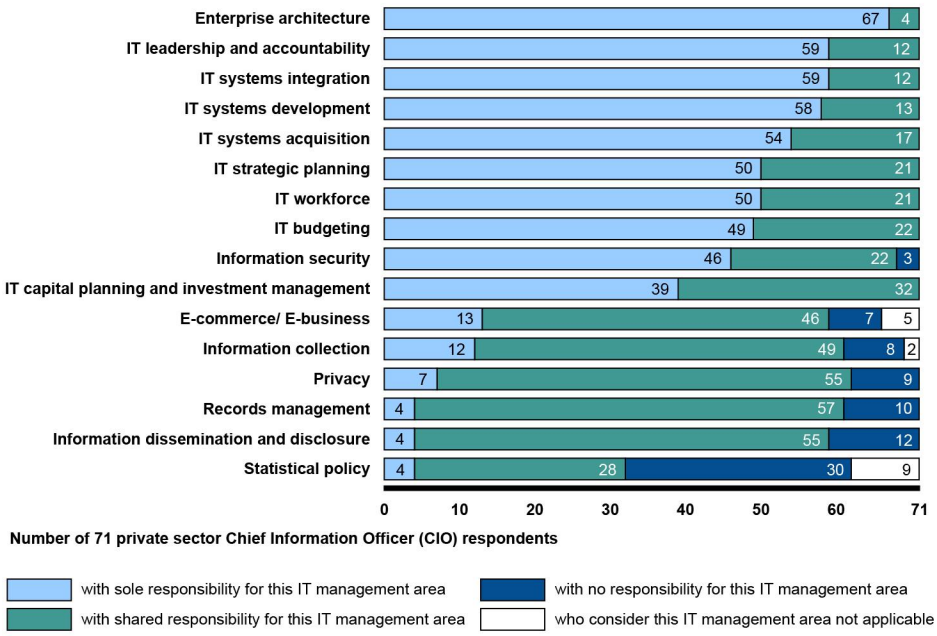
GAO conducted a survey of a non-generalizable sample of private sector CIOs and asked about their responsibilities, experience, and qualifications. Of 488 surveys sent, CIOs or CIO equivalents returned 71 fully complete responses. GAO then compared the results of the completed surveys to the responsibilities outlined in laws and Office of Management and Budget guidance for agency CIOs and the Federal CIO.

View GAO-22-104603. For more information, contact Kevin Walsh at (202) 512-6151 or walshk@gao.gov.

What GAO Found

A majority of the 71 private sector Chief Information Officer (CIO) survey respondents reported having responsibilities that aligned with those of agency CIOs in 13 of 14 key IT management areas. These areas include strategic planning, investment management, and information security. One area of responsibility (the statistical policy area) was reported by more than half of respondents as being outside their scope of responsibility. In addition, CIO respondents also reported sharing responsibility with other executives in each IT management area (see figure 1).

Figure 1: Extent of Sharing of IT Management Area Responsibilities Reported by 71 Private Sector Chief Information Officer (CIO) Respondents



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Notes: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

This figure shows 16 areas because one of the 14 key responsibility areas (IT systems acquisition, development, and integration) is presented as three different items in order to provide increased visibility into these activities.

Private sector CIO respondents were highly educated and experienced, with a majority reporting previous IT-related experience, previous CIO experience, industry knowledge, and a college degree (see figure 2). Notably, a majority of respondents reported that their degrees were not IT-related. Respondents reported an average tenure in their current CIO role of about 6 years. Among respondents, CIOs with more authority over technology-related decisions tended to have a higher level of previous CIO experience, as well as the longest tenures.

GAO also held two expert panels with both private sector CIOs and former federal agency CIOs. Both panels addressed their experiences with qualifications, tenure, reporting relationships, and challenges. After holding the panels, GAO analyzed the main points made by the panelists and developed resulting common themes from the discussions.

What GAO Recommends

GAO is recommending that Congress consider formalizing the Federal CIO position and establishing responsibilities and authorities for government-wide IT management.

GAO is making two recommendations to the Director of the Office of Management and Budget to increase emphasis on collaboration between CIOs and other executives, and to take steps to ensure that managerial skills have an appropriate role in CIO hiring criteria. Staff from the Office of Management and Budget did not agree or disagree with GAO's recommendations.

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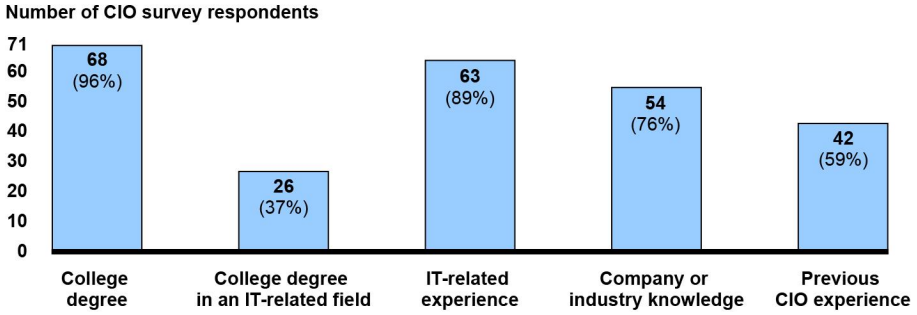
Figure 2: Qualifications and Experience of Private Sector Chief Information Officer (CIO) Respondents



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Accessible Data Table for Figure 2

	College Degree	College degree in an IT related field	IT related experience	Company industry knowledge	Previous CIO experience
Number of CIO survey respondents	68	26	63	54	42
Percent	96%	37%	89%	76%	59%

This graph shows selected responses from two survey questions. The variables are categorical and the numbers are not intended to add to 71 or the percentages to 100 percent.

Responsibilities currently assigned to the Federal CIO correspond to those of agency CIOs in 10 of the 14 key IT management areas. The Federal CIO's responsibilities also correspond to those of private sector survey respondents in each of five responsibility areas directly relevant to the roles of both. However, the Federal CIO position is not established in law, and its main legal authorities remain those established in 2002 for the OMB position from which the role was established. As such, its responsibilities are often more limited in key CIO management areas than those of the other types of CIOs. For example, the Federal CIO is not responsible for ensuring that cybersecurity duties are carried out. By formalizing the Federal CIO position and establishing responsibilities and authorities over government-wide IT management, the position's impact over federal IT may be more consistent over time and across administrations.

Private sector and former agency CIOs participating in panel discussions reported challenges faced by federal agency CIOs. Specifically, private sector CIO panelists stated that collaboration between the CIO and other senior executives is essential to driving successful business outcomes. Conversely, former federal CIO panelists reported difficulty achieving meaningful collaboration with other managers. In addition, private sector panelists stated that their companies often look for managerial skills, such as project management skills, when hiring CIOs. By contrast, former agency CIO panelists stated that

technical skills are often a primary driver in the selection of agency CIOs. Fostering shared collaboration and increasing focus on managerial skillsets for agency CIOs could assist federal agencies and their CIOs in securing resources and implementing IT priorities.

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Abbreviations

CEO	chief executive officer
CFO	chief financial officer
CIO	chief information officer
COO	chief operating officer
CTO	chief technology officer
FITARA	Federal Information Technology Acquisition Reform Act
OIRA	Office of Information and Regulatory Affairs
OMB	Office of Management and Budget

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September 15, 2022

The Honorable Carolyn B. Maloney
Chairwoman
The Honorable James R. Comer
Ranking Member
Committee on Oversight and Reform
House of Representatives

The Honorable Gerald E. Connolly
Chairman
The Honorable Jody Hice
Ranking Member
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Committee on Oversight and Reform
House of Representatives

Information systems are critical to the health, economy, and security of the nation. To develop and maintain these systems, in fiscal year 2022, the federal government has projected that it will spend approximately $111 billion on IT investments. Although the government makes substantial annual investments, it faces longstanding problems in its management of IT. Our most recent high-risk series update continues to identify the management of IT acquisitions and operations and information security as government-wide challenges.[1]

Over the years, Congress has enacted various laws in an attempt to improve the government's management of IT. For example, the Clinger-Cohen Act of 1996 required agency heads to designate Chief Information Officers (CIO) to lead reforms that would help control system development risks, better manage technology spending, and achieve measurable improvements in agency performance.[2] In addition, the Federal Information Security Management Act of 2002[3] and its successor,

[1]GAO, *High-Risk Series: Dedicated Leadership Needed to Address Limited Progress in Most High-Risk Areas*, GAO-21-119SP (Washington, D.C.: Mar. 2, 2021).

[2]40 U.S.C. §§ 3506, 11312, and 11313.

[3]Pub. L. No. 107-347, §§ 301-05, 116 Stat. 2899, 2946-61.

the Federal Information Security Modernization Act of 2014,[4] made CIOs responsible for ensuring that agencies develop, document, and implement information security programs. Further, federal IT acquisition reform legislation (commonly referred to as the Federal Information Technology Acquisition Reform Act, or FITARA), which was enacted in December 2014, strengthened the role of covered agency CIOs in managing IT.[5]

In addition to legislation addressing or enhancing the role of agency CIOs, Congress enacted the E-Government Act of 2002 to address the challenges of managing federal government programs and services in the information age.[6] To assist in this effort, the act established the Office of Electronic Government (now called the Office of E-Government and Information Technology) within the Office of Management and Budget (OMB). In 2009, the President designated the Administrator of this office as the Federal CIO, to direct and oversee government-wide IT in several key management areas.[7]

We also have long been proponents of having strong CIOs in place to lead federal agencies' management of IT.

- In 1994, we reported on IT management best practices for federal agencies to follow, including the establishment of a CIO to liaise with senior management in order to build organization-wide information management capabilities.[8]

[4]Pub. L. No. 113-283, 128 Stat. 3073.

[5]Carl Levin and Howard P. 'Buck' McKeon National Defense Authorization Act for Fiscal Year 2015, Pub. L. No. 113-291, §§ 831-37, 128 Stat. 3292, 3438-50 (2014).

[6]Pub. L. No. 107-347, 116 Stat. 2899.

[7]The White House issued a press release on March 5, 2009, announcing the designation of the Administrator of the Office of Management and Budget's (OMB) Office of Electronic Government and Information Technology as the Federal CIO and outlining its duties.

[8]GAO, *Executive Guide: Improving Mission Performance Through Strategic Information Management and Technology*, GAO/AIMD-94-115 (Washington, D.C.: May 1, 1994).

- In 1996, we reported that further defining federal agency CIO roles, responsibilities, and authorities is necessary to fully identify efficiencies in selecting and managing IT investments.[9]
- In July 2004, September 2011, and August 2018, we reported on federal agency CIOs, including their responsibilities, tenure, and challenges.[10]

Also, in September 2016, the Comptroller General convened a forum with current and past CIOs, which explored challenges and opportunities for CIOs to improve federal IT acquisitions and operations.[11]

Recognizing the continued importance of the CIO position in achieving better results through IT management, you asked us to conduct a review of the extent of alignment between the responsibilities of federal CIOs and their private sector counterparts. Our specific objectives were to determine (1) the responsibilities of selected CIOs in the private sector and how they compare to the responsibilities of federal agency CIOs; (2) the qualifications and tenure of selected CIOs in the private sector; (3) how the responsibilities of the Federal CIO compare with those of federal agency and private sector CIOs; and (4) how private sector CIO experiences can be applied to the challenges facing federal agency CIOs.

To address all of the objectives, we (1) identified a comprehensive list of agency CIO and Federal CIO responsibilities for comparison with those of private sector CIOs; (2) selected private sector companies to include in a survey; (3) created, pretested, and administered the survey; and (4) conducted expert panels with selected private sector and former agency CIOs. Specifically, we:

[9]GAO, *Information Technology Investment: Agencies Can Improve Performance, Reduce Costs, and Minimize Risks*, GAO/AIMD-96-64 (Washington, D.C.: Sept. 30, 1996).

[10]GAO, *Federal Chief Information Officers: Responsibilities, Reporting Relationships, Tenure, and Challenges,* GAO-04-823 (Washington, D.C.: July 21, 2004); *Federal Chief Information Officers: Opportunities Exist to Improve Role in Information Technology Management,* GAO-11-634 (Washington, D.C.: Sept. 15, 2011); and *Federal Chief Information Officers: Critical Actions Needed to Address Shortcomings and Challenges in Implementing Responsibilities,* GAO-18-93 (Washington, D.C.: Aug. 2, 2018).

[11]GAO, *Federal Chief Information Security Officers: Opportunities Exist to Improve Roles and Address Challenges to Authority,* GAO-16-686 (Washington, D.C.: Aug. 26, 2016).

- Identified and analyzed 14 IT management areas and 35 corresponding areas of responsibility in laws and guidance that are relevant to agency CIOs;
- Identified and analyzed 35 IT management responsibilities originally assigned to the OMB Administrator for E-Government, and currently assigned to the Federal CIO;
- Created a list of private sector companies comparable in number of employees and budget to the 24 federal agencies covered by the Chief Financial Officers (CFO) Act of 1990;
- Randomly selected 488 CIOs from the private sector companies on this list;[12]
- Sent a survey to the 488 private sector CIOs with questions related to each of the 14 IT management areas. The final survey sent to participants is replicated in appendix I, along with a summary of responses;
- Obtained and analyzed fully completed responses from 71 CIOs or CIO equivalents (a nearly 15 percent response rate). Appendix II includes a list of the CIOs who participated in our survey and chose to be acknowledged in our report; and
- Convened two panels in January 2022 with a combined 19 private sector and former federal agency CIOs to clarify survey data and to gain insight on CIO qualifications, tenure, and challenges.

For the first objective, we analyzed and reported on survey responses related to the extent to which private sector CIOs had responsibility for the 14 IT management areas, as well as related responsibilities. We also analyzed responses about shared responsibility for each of the management areas, whether CIOs had responsibilities for additional areas, and the direct reporting relationships of CIOs. We also met with staff from OMB and the Federal CIO to discuss the role of agency CIOs and the Federal CIO.

For the second objective, we analyzed and reported on survey responses regarding the education levels, qualifications, prior experience, and tenure of the CIOs. We also analyzed the relationship between the survey respondents' education level, prior CIO experience, tenure, and the

[12]Because the selection of the companies for this study was done according to a non-probability sample, the results are not intended to represent all CIOs or companies, and the CIOs we surveyed are not representative of all of those in the private sector.

degree to which respondents had responsibility for all technology decisions at their companies.

For the third objective, we compared responsibilities currently assigned to the Federal CIO and to agency CIOs to determine the extent to which Federal CIO responsibilities covered each of the 14 IT management areas, and whether their level of specificity differed from those of federal agency CIO responsibilities with some IT management areas. We also analyzed and reported on survey responses related to responsibilities shared by the Federal CIO and private sector CIOs to determine the extent to which respondents had responsibility for specific areas currently assigned to the Federal CIO.

For the fourth objective, we analyzed statements from private sector and former federal agency CIO panelists to determine issues that were viewed as (1) handled differently by private sector companies versus federal agencies, and (2) challenges to federal agency CIOs. We then compared expert panelists' consensus of federal actions to relevant best practices. Further details on our objectives, scope, and methodology can be found in appendix III.

We conducted this performance audit from October 2020 to September 2022 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

As previously mentioned, over the past several decades, various laws have been enacted specifying the roles and responsibilities of federal agencies, including roles and responsibilities that have been assigned to agency CIOs. These laws were intended to improve the government's performance in IT and related information management functions. The laws include:

- the Paperwork Reduction Act,[13]
- the Clinger-Cohen Act of 1996,[14]
- the Federal Information Security Management Act of 2002,[15]
- the Federal Information Security Modernization Act of 2014,[16] and
- the provisions commonly referred to as the Federal Information Technology Acquisition Reform Act.[17]

These and other laws also assigned OMB and its director key roles in helping agencies effectively manage IT. Under such authorities, OMB has issued guidance to agencies on many IT management areas, including guidance on agency CIO IT management and information security responsibilities, such as *Management and Oversight of Federal Information Technology,* Memorandum M-15-14,[18] annual guidance on federal information security and privacy management requirements, and

[13]44 U.S.C. §§ 3501-3521. The Paperwork Reduction Act of 1980 required that each agency head designate a senior official who would directly report to the head to be responsible for the management of the agency's information systems. Pub. L. No. 96-511, § 2, 94 Stat. 2812, 2819 (1980). The Paperwork Reduction Act of 1995 amended the original law to place the management of IT under the umbrella of information resources management. Pub. L. No. 104-13, 109 Stat. 163 (1995).

[14]Pub. L. No. 104-106, §§ 5001-5703, 110 Stat. 186, 679-703, (1996) codified, as amended, at 40 U.S.C. §§ 11101-11703)

[15]Pub. L. No. 107-347, §§301-05, 116 Stat. 2899, 2946-61.

[16]Pub. L. No. 113-283, 128 Stat. 3073.

[17]Carl Levin and Howard P. 'Buck' McKeon National Defense Authorization Act for Fiscal Year 2015, Pub. L. No. 113-291, §§831-37, 128 Stat. 3292, 3438-50 (2014).

[18]OMB, *Management and Oversight of Federal Information Technology*, Memorandum M-15-14 (Washington, D.C.: June 10, 2015).

revisions to Circular No. A-130, *Managing Information as a Strategic Resource.*[19]

More recently, on May 15, 2018, the President signed Executive Order 13833, *Enhancing the Effectiveness of Agency Chief Information Officers*.[20] This order, which applied to all agencies covered by the Chief Financial Officers Act of 1990, apart from the Department of Defense and any agency considered to be an independent regulatory agency, strengthened the role of agency CIOs.[21] It did so by, among other things, requiring agency CIOs to (1) report directly to their agency head; (2) to serve as their agency head's primary IT strategic advisor; and (3) have a significant role in all management, governance, and oversight processes related to IT. In addition, one of its cybersecurity requirements directs agencies to ensure that the CIO works closely with an integrated team of senior executives, including those with expertise in IT, security, and privacy, to implement appropriate risk management measures.

The key responsibilities given to agency CIOs can be generally divided into 14 IT management areas. In addition to these, some of the management areas have related responsibilities that are required by statute or are critical to federal CIOs for effectively managing IT. Table 1 summarizes the primary responsibilities given to agency CIOs in laws and guidance, and related management areas.

Table 1: Summary of Responsibilities In Each of the 14 Agency Chief Information Officer (CIO) IT Management Areas

Management area and related responsibilities	Source
IT leadership and accountability – *CIOs are responsible and accountable for the effective implementation of IT management responsibilities*.	Paperwork Reduction Act of 1995[a], Clinger-Cohen Act of 1996, Federal Information Security Modernization Act of 2014, Federal Information Technology Acquisition Reform Act, Office of Management and Budget (OMB) M-15-14, OMB Circular A-130, and Executive Order 13833, *Enhancing the Effectiveness of Agency Chief Information Officers*[b]

[19]OMB, Circular No. A-130, *Managing Information as a Strategic Resource* (Washington, D.C.: July 28, 2016).

[20]Exec. Order No. 13833, *Enhancing the Effectiveness of Agency Chief Information Officers*; 83 Fed. Reg. 23345 (May 15, 2018).

[21]As amended, the Chief Financial Officers Act of 1990, lists 24 federal entities as covered agencies. 31 U.S.C. § 901(b). "Independent regulatory agencies" are defined under 44 U.S.C. § 3502(5).

Management area and related responsibilities	Source
Report directly to the agency head or that official's deputy.	Paperwork Reduction Act of 1995[a], OMB M-15-14, and Executive Order 13833, *Enhancing the Effectiveness of Agency Chief Information Officers*
Approve the selection of bureau CIOs.	Federal Information Technology Acquisition Reform Act, OMB A-130, and OMB M-15-14
Designate a senior agency information security officer.	Federal Information Security Modernization Act of 2014
Assume responsibility and accountability for IT investments.	Paperwork Reduction Act of 1995[a] and Clinger-Cohen Act of 1996
IT strategic planning – *CIOs are responsible for strategic planning for all IT management functions*.	Clinger-Cohen Act of 1996[b]
Establish goals for improving agency operations through IT.	Clinger-Cohen Act of 1996
Measure how well IT supports agency programs.	Clinger-Cohen Act of 1996
IT workforce – *CIOs are responsible for assessing agency IT workforce needs and developing strategies and plans for meeting those needs*.	Clinger-Cohen Act of 1996, OMB A-130, and OMB M-15-14[b]
Assess annually the requirements established for agency personnel regarding IT management knowledge and skills.	Clinger-Cohen Act of 1996, OMB A-130, and OMB M-15-14
Assess annually the extent to which agency personnel meet IT management knowledge and skill requirements.	Clinger-Cohen Act of 1996
Annually develop strategies for hiring and training to rectify any knowledge and skill deficiencies.	Clinger-Cohen Act of 1996
IT budgeting – *CIOs are responsible for the processes for all annual and multi-year IT planning, programming, and budgeting decisions.*	Federal Information Technology Acquisition Reform Act, OMB A-130, and OMB M-15-14
IT capital planning and investment management – *CIOs are responsible for the processes for managing, evaluating, and assessing how well the agency is managing its IT resources.*	Clinger-Cohen Act of 1996, Federal Information Technology Acquisition Reform Act, OMB A-130, and OMB M-15-14[b]
Advise the head of the agency on whether to continue, modify, or terminate any acquisition, investment, or activity that includes a significant IT component based on the CIO's evaluation.	Clinger-Cohen Act of 1996 and OMB M-15-14
Review and approve IT contracts, acquisition plans, or strategies.	Federal Information Technology Acquisition Reform Act, OMB A-130, and OMB M-15-14
Information security – *CIOs are responsible for establishing, implementing, and ensuring compliance with an agency-wide information security program.*	Federal Information Security Modernization Act of 2014[b]
Ensure that senior agency officials, including CIOs of bureaus or equivalent officials, carry out their information security responsibilities.	Federal Information Security Modernization Act of 2014
Ensure that agency personnel, including those with significant responsibility for information security, are trained to effectively carry out information security policies, procedures, and control techniques.	Federal Information Security Modernization Act of 2014
E-commerce/E-business – *CIOs are to promote the use of IT by the agency to improve the productivity, efficiency, and effectiveness of agency programs*.	Paperwork Reduction Act of 1995[a]
Enterprise architecture – *CIOs are responsible for developing, maintaining, and facilitating the implementation of a sound, secure, and integrated IT architecture for the executive agency*.	Clinger-Cohen Act of 1996 and Intelligence Reform and Terrorism Prevention Act of 2004

Management area and related responsibilities	Source
Systems acquisition, development, and integration – *CIOs are responsible for maximizing the value, and assessing and managing the risks, of major information systems initiatives.*	Paperwork Reduction Act of 1995[a] and Clinger-Cohen Act of 1996
Information collection – *CIOs are responsible for the review of agency information collection proposals to evaluate the need for and burden of collected information.*	Paperwork Reduction Act of 1995[a]
Records management – *CIOs are responsible for ensuring that the agency implements and enforces records management policies and procedures under the Federal Records Act.*	Paperwork Reduction Act of 1995[a]
Information dissemination and disclosure – *CIOs are responsible for ensuring that the agency's information dissemination activities meet policy goals such as timely and equitable public access to information and for information access under the Freedom of Information Act.*	Paperwork Reduction Act of 1995[a]
Privacy – *CIOs are responsible for compliance with the Privacy Act and related laws.*	Paperwork Reduction Act of 1995[a] and Clinger-Cohen Act of 1996
Statistical policy – *CIOs are responsible for the agency's statistical policy and coordination functions, including ensuring the relevance, accuracy, and timeliness of information collected or created for statistical purposes.*	Paperwork Reduction Act of 1995[a]

Legend: Grey shade = primary IT management area, white shade = related responsibility area.

Source: GAO analysis of federal legislation and guidance. | GAO-22-104603

[a]The Clinger-Cohen Act of 1996 included a provision which assigned many existing agency information resource management activities introduced in the Paperwork Reduction Act of 1995, to the agency CIO. See 44 U.S.C. 3506(a)(2)(A).

[b]Sources listed for IT management areas with related responsibility areas are a summary of those for the related responsibilities listed.

Laws and OMB Guidance Detail the Responsibilities Currently Assigned to the Federal CIO

Many of these same federal laws have also over time given some government-wide IT management responsibilities to OMB. Specifically,

- The Paperwork Reduction Act of 1980 established an office within OMB to which it gave responsibility for oversight of federal IT management (then termed automatic data processing and telecommunications functions).[22] The 1995 amendments to the Paperwork Reduction Act continued these responsibilities, therein referred to as information resources management.

[22]Pub. L. No. 96-511, § 3503, 94 Stat. 2812, 2814-15 (codified, as amended, at 44 U.S.C. § 3503).

- The 1996 Clinger-Cohen Act further required OMB to strengthen federal IT management through the use of capital planning and investment control, and performance management.[23]
- Congress and the President enacted the E-Government Act of 2002 to address the challenges of managing federal government programs and services in the age of the internet.[24]

These and other laws assign two offices within OMB—the Office of Information and Regulatory Affairs (OIRA) and the Office of E-Government and Information Technology—key roles in helping agencies effectively manage IT.

- **OIRA.** The Paperwork Reduction Act of 1980 established OIRA within OMB and gave the office responsibility for oversight of federal IT management (then termed automatic data processing and telecommunications functions). The 1995 amendments to the Paperwork Reduction Act continued these responsibilities, therein referred to as information resources management. The 1996 Clinger-Cohen Act further required OMB to strengthen federal IT management through the use of capital planning and investment control, and performance management.
- **Office of E-Government and Information Technology.** Congress enacted the E-Government Act of 2002 to address the challenges of managing federal government programs and services in the age of the internet. To assist in this effort, the act established the Office of Electronic Government within OMB (now called the Office of E-Government and Information Technology). This office, in coordination with OIRA, is responsible for overseeing the implementation of IT management responsibilities.

In addition, the Administrator of the Office of E-Government and Information Technology gained increased responsibility through passage of the Program Management Improvement Accountability Act,[25] the Tested Ability to Leverage Exceptional National Talent Act of 2017,[26] and

[23]Codified, as amended, at 40 U.S.C. §§ 11302-03.

[24]Pub. L. No. 107-347, 116 Stat. 2899.

[25]Pub. L. No. 114-264, 130 Stat. 1371 (2016).

[26]Pub. L. No. 115-1, 131 Stat. 3 (2017).

the Foundations for Evidence-Based Policymaking Act of 2018.[27] Table 2 summarizes specific IT-related responsibilities given to the Administrator of the Office of E-Government and Information Technology in federal law.

Table 2: Summary and Source of Responsibilities Given to the Administrator of the Office of E-Government and Information Technology

Responsibility	Source
Establish and promote a government-wide program aimed at encouraging contractor innovation and excellence in facilitating the development and enhancement of electronic government services and processes.	E-Government Act of 2002
Assist the General Services Administration in administering the E-Government Fund, to enable the federal government to expand its ability, through the development and implementation of innovative uses of the internet or other electronic methods, to conduct activities electronically.	E-Government Act of 2002
Along with the Administrator of the Office of Information and Regulatory Affairs and with other offices within the Office of Management and Budget, the Federal CIO should oversee the implementation of the E-Government Act of 2002, and other relevant statutes.	
Advise the Director of the Office of Management of Budget on the resources required to develop and effectively administer electronic government initiatives.	
Recommend to the Director changes relating to government-wide strategies and priorities for electronic government.	
Provide overall leadership and direction to the executive branch on electronic government.	
Promote innovative uses of IT by agencies, particularly initiatives involving multi-agency collaboration, through support of pilot projects, research, experimentation, and the use of innovative technologies.	
Oversee the distribution of funds from, and ensure appropriate administration and coordination of, the E-Government Fund.	
Coordinate with the Administrator of General Services regarding programs undertaken by the General Services Administration to promote electronic government and the efficient use of IT by agencies.	
Lead the activities of the Chief Information Officers Council established in the E-Government Act of 2002 on behalf of the Deputy Director for Management, who shall chair the council.	
Assist the Director in establishing policies which shall set the framework for IT standards for the federal government developed by the National Institute of Standards and Technology and promulgated by the Secretary of Commerce.	
Sponsor a dialogue between federal, state, local, and tribal government leaders on electronic government to encourage collaboration, improve the use of IT, and enhance the understanding of best practices and innovative uses of IT.	
Sponsor activities to engage the general public in the development and implementation of policies and programs, particularly activities aimed at fulfilling the goal of using the most effective citizen-centered strategies and those activities which engage multiple agencies providing similar or related information and services.	
Oversee the work of the General Services Administration and other agencies in developing the integrated internet-based system under section 204 of the E-Government Act of 2002.	E-Government Act of 2002

[27]Pub. L. No. 115-435, 132 Stat. 5529 (2019).

Responsibility	Source
Work with the Administrator for Federal Procurement Policy to ensure effective implementation of electronic procurement initiatives.	
Assist federal agencies in implementing accessibility standards under the Rehabilitation Act of 1973.	
Oversee the development of enterprise architectures within and across agencies.	
Assist in overseeing agency efforts to ensure that electronic government activities incorporate adequate, risk-based, and cost-effective security compatible with business processes.	
Administer the Office of Electronic Government established under the E-Government Act of 2002.	
Assist the Director in preparing an E-Government report as established in the E-Government Act of 2002.	
Assist in setting the strategic direction for implementing electronic government laws and initiatives, and assist the Director in carrying out those laws and initiatives.	
Along with the CIO Council, identify, develop, and coordinate multi-agency projects and other innovative initiatives to improve government performance through the use of IT.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to capital planning and investment control for IT.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to the development of enterprise architectures.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to information security.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to privacy.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to access to, dissemination of, and preservation of government information.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to accessibility of IT.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to other areas of IT.	
Consult with the agency CIO and program manager of certain major IT investment projects that receive a high risk rating when they conduct a review to identify the reasons for the high level of risk of the investment, the extent to which the causes can be addressed, and the probability of future success. The Federal CIO also then communicates the results of those reviews to certain Congressional committees.	Federal Information Technology Acquisition Reform Act
Hold membership on the Program Management Policy Council.	Program Management Improvement Accountability Act
Hold membership on the Presidential Innovation Fellows Program advisory board.	Tested Ability to Leverage Exceptional National Talent Act of 2017
Chair the Technology Modernization Board.	Modernizing Government Technology Act
Hold membership on the Chief Data Officer Council.	

Responsibility	Source
Issue guidance jointly with the Administrator of the Office of Information and Regulatory Affairs for agencies to develop and maintain comprehensive data inventories (authority delegated from the Director).	Foundations for Evidence-Based Policymaking Act of 2018

Source: GAO analysis of federal laws and guidance. | GAO-22-104603

In March 2009, the President designated the position of Administrator of Electronic Government and Information Technology as the Federal CIO, increasing the scope of its responsibilities for government-wide IT management. Among other things, the President gave the Federal CIO responsibility for directing the policy and strategic planning of federal IT investments, overseeing federal technology spending, and ensuring information security and privacy across the federal government. The Federal CIO was delegated further responsibility in subsequent OMB guidance. For example, in 2012, the Federal CIO was tasked with developing a comprehensive strategy to better deliver digital services to the American people. In 2015, it was also tasked with establishing a dedicated team to oversee agency and government-wide cybersecurity programs.

GAO's Work Has Focused on Improving Federal CIO Roles and Responsibilities

We have previously reported on the roles and responsibilities of CIOs in both the federal government and in the private sector. For example:

- In July 2004, we noted that not all agency CIOs exercised all responsibilities required by statute or that were critical to effective IT management.[28] In addition, we examined the tenure of these officials, noting that CIOs and former agency IT executives believed it was necessary for a CIO to stay in office for 3 to 5 years to be effective. However, at the time of our review, the median tenure of permanent CIOs whose time in office had been completed was about 2 years.

  We also reported on agency CIO challenges in the following areas:

  - **Implementing effective IT management:** improving information security and strengthening processes to ensure investments align with mission and business needs.

[28]GAO-04-823.

- **Obtaining sufficient and relevant resources:** budget, recruiting, training, retention, and succession planning.
- **Communicating and collaborating internally and externally:** cultivating and maintaining partnerships while producing results in the best interest of the enterprise, and establishing supporting governance structures that ensure two-way communication with agency head and with the "business" aspect of an agency.
- **Managing change:** maintaining compliance and overcoming institutional resistance to change.

- In September 2005, we reported on the responsibilities given to private sector CIOs in areas such as IT governance.[29] Almost all of the private sector CIOs had responsibility for five areas: systems acquisition, IT capital planning, information security, IT human capital, and e-commerce. In three of these five areas—information security, IT human capital, and IT capital planning—all but one of the private sector CIOs had or shared responsibility as well. The functional areas of information collection, information dissemination and disclosure, enterprise architecture, and strategic planning had the greatest difference in responsibilities between private sector and federal CIOs.

  We also noted that private sector CIOs reported four major challenge areas: (1) increasing IT's contribution to the company's bottom line, such as aligning IT to business goals; (2) implementing new enterprise technologies to improve business processes; (3) controlling IT costs and increasing IT efficiencies; and (4) ensuring data security and integrity.
- In September 2011, we conducted a second review of federal CIO roles and responsibilities.[30] We reported that CIOs did not consistently have responsibility for 13 major areas of IT and information management as defined by law or deemed critical to effective IT management. In addition, we noted that just over half of CIOs reported directly to the heads of their respective agencies.
- In April 2017, we reported on the results of a CIO forum, convened by the Comptroller General on September 14, 2016.[31] The panel

[29]GAO, *Chief Information Officers: Responsibilities and Information Technology Governance at Leading Private-Sector Companies,* GAO-05-986 (Washington, D.C.: Sept. 9, 2005).

[30]GAO-11-634.

[31]GAO, *Information Technology: Opportunities for Improving Acquisitions and Operations,* GAO-17-251SP (Washington, D.C.: Apr. 11, 2017).

explored the challenges and opportunities for CIOs to improve federal IT acquisitions and operations. The panel participants identified key actions related to strengthening FITARA and improving CIO authorities. Panel participants also noted challenges in IT areas such as budget formulation, governance, workforce, operations, and transition planning.

- In August 2018, we reported on critical actions needed by federal agencies to address shortcomings and challenges in implementing CIO responsibilities.[32] In a review of the 24 agencies covered by the Chief Financial Officers Act of 1990, none fully addressed the role of their CIOs consistent with federal laws and guidance. In addition, the majority of the agencies did not address the role of their CIOs in the areas of IT leadership and accountability, IT budgeting, information security, IT investment management, IT strategic planning, and IT workforce.

Private Sector CIO Responsibilities Were Often Aligned with Those of Agency CIOs

A majority of private sector CIO respondents reported responsibilities that aligned with those of agency CIOs in nearly all of the 14 IT management areas.[33] Respondents also reported regularly sharing IT management responsibilities with other executives in all of the management areas, most significantly in those related to the management of information. The respondents who reported directly to their companies' chief executive officers (CEO) or chief operations officers (COO) reported sharing their responsibilities less than those that directly reported to other executives. In addition to the 14 IT management areas, the private sector CIOs had responsibilities that were not formally established for agency CIOs.[34]

[32]GAO-18-93.

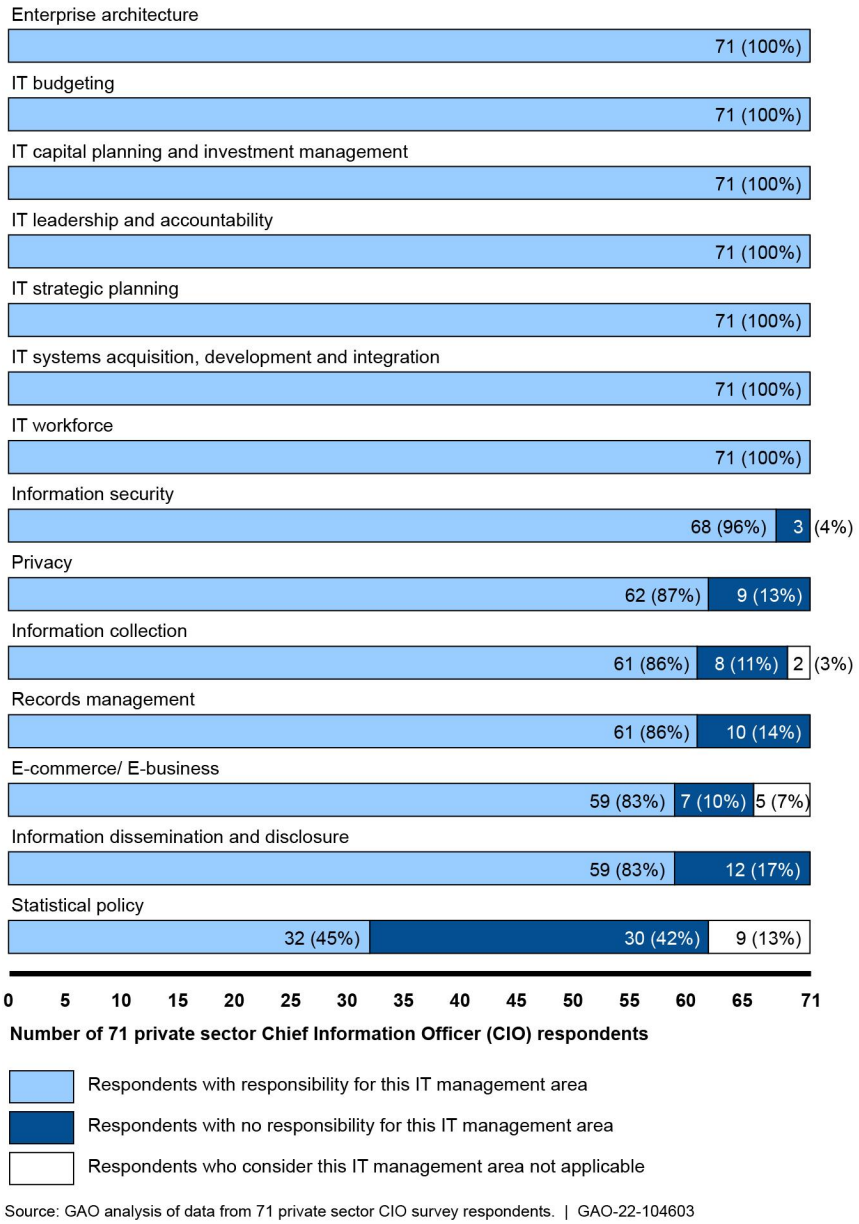
[33]In our survey, we separated the management area of IT systems acquisition, development, and integration into three areas to obtain more accurate results regarding the extent to which responsibilities are shared with other executives. As a result, information on which responsibilities are shared are divided between 16 management areas, rather than 14.

[34]Federal agency CIOs may also perform responsibilities beyond those that are formally established in law and guidance.

A Majority of Private Sector CIO Respondents Reported Responsibilities That Aligned with Those of Agency CIOs

A majority of private sector CIO respondents reported that their responsibilities aligned with those of agency CIOs. Specifically, private sector CIOs reported having responsibilities similar to those of agency CIOs in 13 of these 14 areas. Figure 1 shows the number and percentage of the 71 private sector CIOs respondents that reported having responsibility for each of the 14 IT management areas.

Figure 1: Status of 71 Private Sector Chief Information Officer (CIO) Survey Respondents' Responsibility for IT Management Areas



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Accessible Data Table for Figure 1

Federal Area	Total Yes	No	Not applicable
Enterprise architecture	71	0	0
IT budgeting	71	0	0
IT capital planning and investment management	71	0	0
IT leadership and accountability	71	0	0
IT strategic planning	71	0	0
IT systems acquisition	71	0	0
IT workforce	71	0	0
Information security	68	3	0
Privacy	62	9	0
Information collection	61	8	2
Records management	61	10	0
E-commerce/ E-business	59	7	5
Information dissemination and disclosure	59	12	0
Statistical policy	32	30	9

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

As shown in the figure,

- all 71 respondents reported responsibility for seven of the 14 IT management areas;
- 68 CIOs—more than 95 percent of respondents—reported responsibility for the area of information security; and
- between 80 and 90 percent of respondents reported responsibility for five areas: privacy (87 percent, or 62 CIOs), information collection (86 percent, or 61 CIOs), records management (86 percent, or 61 CIOs), e-commerce/e-business (83 percent, or 59 CIOs), and information dissemination and disclosure (83 percent, or 59 CIOs).

The high degree of alignment between the respondents' responsibilities and agency CIO responsibilities reflects an increase in the reported responsibilities of private sector CIOs in some information management areas. In particular, in a similar survey of private sector CIOs in 2005,

- 36 percent (five of 14) of CIOs reported responsibility for information collection, versus 86 percent today;
- 50 percent (nine of 18) of CIOs reported responsibility for information dissemination and disclosure, versus 83 percent today;
- 60 percent (12 of 20) of CIOs reported responsibility for privacy, versus 87 percent today; and
- 75 percent (15 of 20) reported responsibility for records management, versus 86 percent today.[35]

Conversely, a smaller number of CIO respondents reported having responsibility in the area of statistical policy. In particular, 32 of the 71 respondents, or 45 percent, described this area as within their scope of responsibility. This echoed what we previously reported in 2011 regarding agency CIOs. Specifically, in 2011 only seven of 30 responding CIOs reported having responsibility for statistical policy, including ensuring the relevance, accuracy, and timeliness of information collected or created for statistical purposes at their agency.[36] At that time, many of the agency CIOs we surveyed reported statistical policy and coordination functions as least important among the management areas to accomplishing the CIO's mission, and other designated officials performed those duties.

Private Sector CIO Respondents Shared Responsibilities with Other Executives

Private sector CIO respondents regularly reported sharing IT management responsibilities with other executives.[37] On average, anywhere from six to 80 percent of private sector CIOs (from four to 57 CIOs) reported sharing responsibility for each of the 16 IT management areas. At least 30 percent of private sector CIO respondents (or 21 CIOs) reported that they shared responsibility with other executives for 11 of the areas. Figure 2 shows the degree of sharing of responsibilities reported by each of the 71 private sector CIO respondents in each management area.

[35]GAO-05-986.

[36]GAO-11-634.

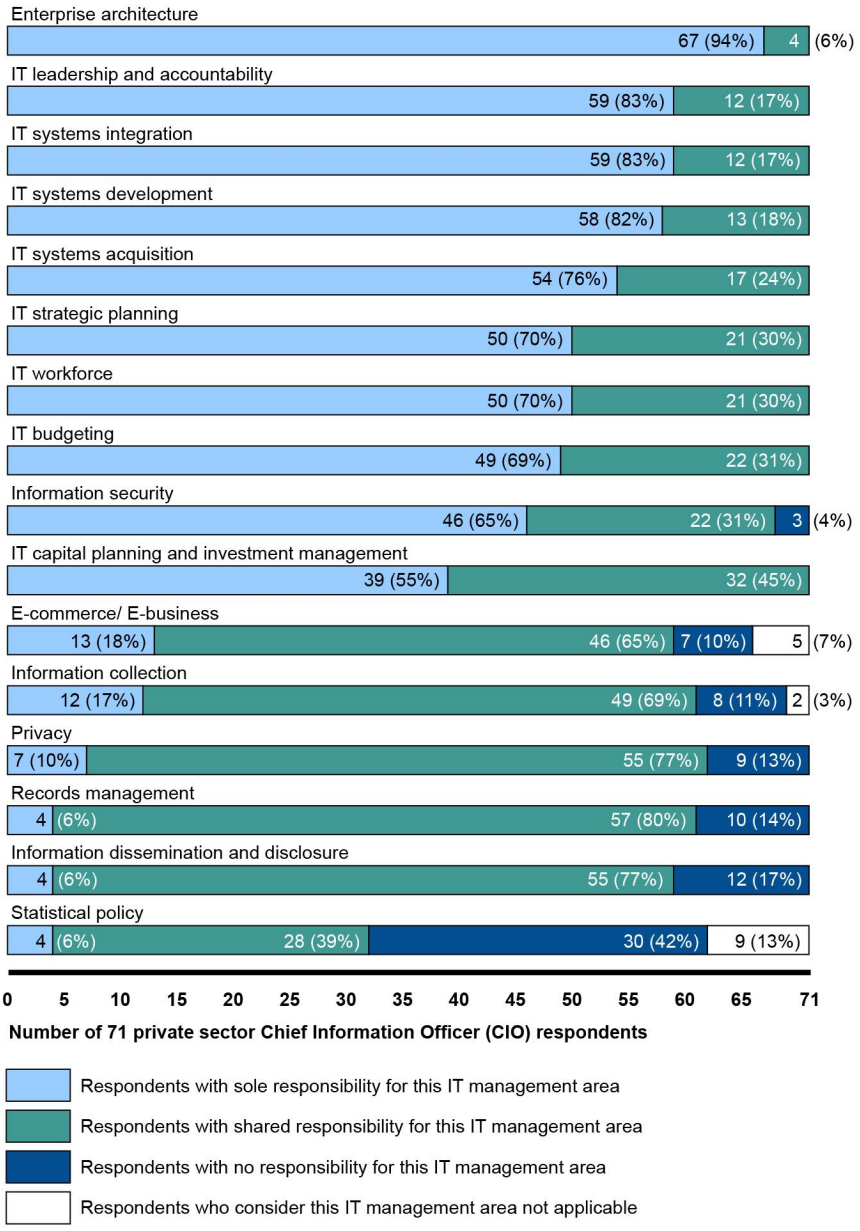
[37]While the former federal agency CIOs in our panel described sharing their responsibilities with other executives, we have not conducted a detailed review of the sharing of federal agency CIO duties.

Maintaining a Sense of Shared Accountability

Private sector chief information officers (CIO) in our expert panel noted that the concept of shared accountability, rather than shared responsibility, was a key part of their business cultures. They also noted that cross-functional teams often work together to drive business outcomes, such as increasing revenue and customer satisfaction. For example, one private sector CIO stated, “to me, a CIO today is really that individual that can sit at the table and really advise the business or advise the mission organizations around the strategic use of technology and information and help them to do better.” Another private sector CIO stated, “we are involved in virtually everything that goes on inside the company, one way or the other.”

Source: GAO expert panel of private sector and former federal agency CIOs. | GAO-22-104603

Figure 2: Extent of Sharing of IT Management Area Responsibilities Reported by 71 Private Sector Chief Information Officer (CIO) Respondents



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Accessible Data Table for Figure 2

Federal Area	Shared responsibility	Only CIO responsibility	No	Not applicable
Enterprise architecture	67	4	0	0
IT systems integration	59	12	0	0
IT leadership and accountability	59	12	0	0
IT systems development	58	13	0	0
IT systems acquisition	54	17	0	0
IT workforce	50	21	0	0
IT strategic planning	50	21	0	0
Information security	46	22	3	0
IT budgeting	49	22	0	0
Statistical policy	4	28	30	9
IT capital planning and investment management	39	32	0	0
E-commerce/ E-business	13	46	7	5
Information collection	12	49	8	2
Information dissemination and disclosure	4	55	12	0
Privacy	7	55	9	0
Records management	4	57	10	0

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

Respondents reported shared responsibility most extensively in several information management responsibility areas:

- 57 CIOs, or 80 percent, reported sharing responsibility for records management;
- 55 CIOs, or 77 percent, reported sharing responsibility for information dissemination; and
- 49 CIOs, or 69 percent, reported sharing responsibility for information collection.

Within several management areas, respondents also reported a high degree of shared responsibilities. For example, one of the areas with the highest degree of sharing responsibilities among respondents was IT capital planning and investment management. Table 3 shows the number and percentage of the 71 private sector CIO respondents that reported having shared or exclusive responsibility for four individual responsibilities within the IT capital planning and investment management area.

Table 3: Extent of Sharing of Responsibilities by 71 Private Sector Chief Information Officer (CIO) Respondents in the Management Area of IT Capital Planning and Investment Management

Responsibility	CIOs sharing this responsibility		CIOs not sharing this responsibility		CIOs that do not have this responsibility		CIOs for whom this responsibility is not applicable	
Advising on whether to continue, modify, or terminate any acquisition, investment, or activity that includes a significant IT component	42	59%	26	37%	3	4%	0	0%
Managing, controlling, evaluating, and assessing how well the company is managing its IT resources and investments and/or having a significant role in IT execution decisions and the management, governance, and oversight processes related to IT	32	45%	39	55%	0	0%	0	0%
Approving IT contracts, acquisition plans, or strategies	25	35%	46	65%	0	0%	0	0%
Consulting with the company's division/component CIOs (or equivalent officials) or other relevant managers of IT investment projects when a project is high risk	25	35%	31	44%	0	0%	15	21%

Source: GAO analysis of data from 71 private sector CIO respondents. | GAO-22-104603

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

The Level of IT Responsibilities Shared by Private Sector CIO Respondents Varied Based on Their Reporting Structure

Private sector CIOs who responded to our survey had direct reporting relationships to several different senior executives at their companies.[38] For example, approximately half of private sector CIOs reported directly to their company's CEO, and about a quarter to their company's CFO. The remainder of the CIO respondents reported directly to other executives, such as their COO, chief technology officer (CTO), president, chief administrative officer, chief growth officer, or the chief of corporate operations. Figure 3 shows the percent of CIO respondents directly reporting to each of the four primary types of senior executives mentioned by CIOs, as well as those reporting to executives other than those four.

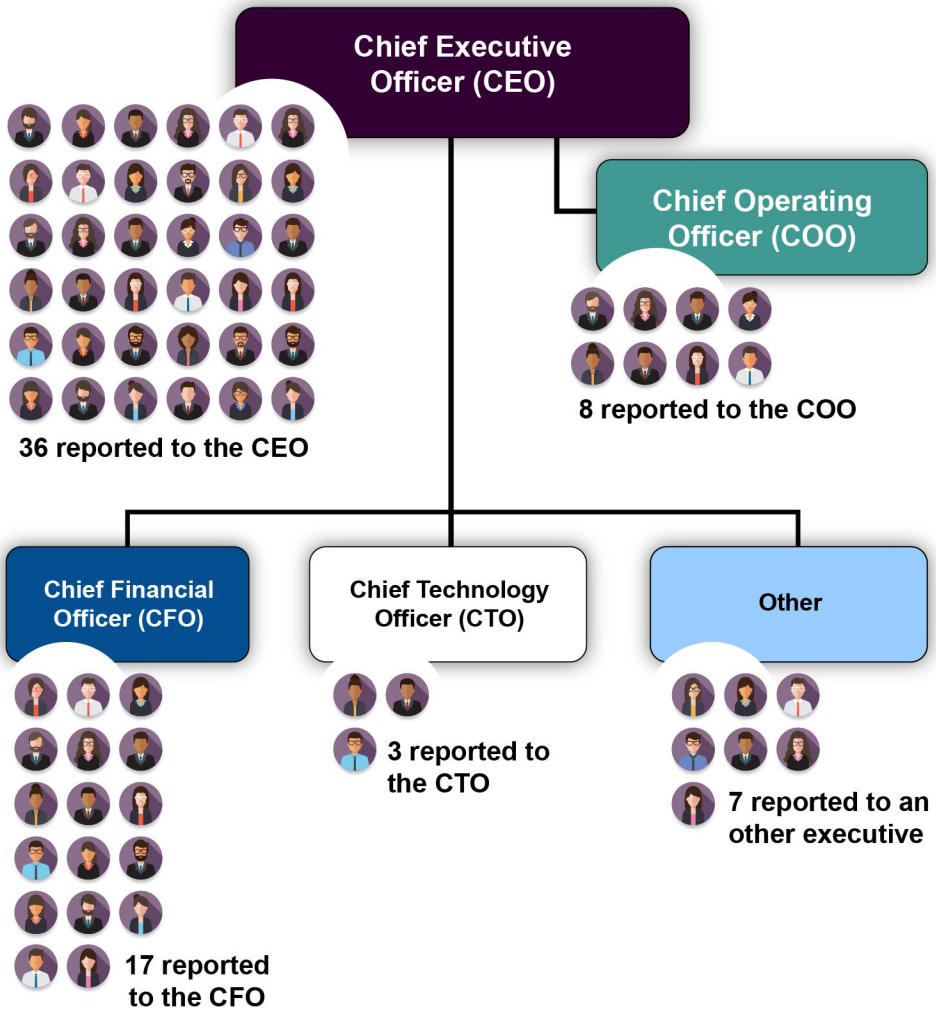
[38]We have previously reported that the CIO's position in the agency hierarchy was a key factor in enabling them to effectively carry out their responsibilities. See GAO-18-93 for further details.

Importance of Chief Information Officer (CIO) Position in Agency Hierarchy

In our expert panel, participants discussed the impact of the CIO having a direct report line to the Chief Executive Officer (CEO). Former federal agency CIOs noted that reporting directly to the CEO or an equivalent official is critical in the federal government. In addition, a former federal agency CIO stated, "the reality was, when that [process for] reporting [to agency head] is formal and everybody sees it and knows it, [other senior people] change how they behave towards you in a federal environment." Several private sector CIO participants also found that it was essential to hold a formal position of authority among other chief executives to ensure they are regularly involved in the company's decision-making process early, convey the importance of technology, and are viewed as enablers of the business strategy.

Source: GAO expert panel of private sector and former federal agency CIOs. | GAO-22-104603

Figure 3: Reporting Structure for 71 Private Sector Chief Information Officer (CIO) Respondents



Source: GAO analysis of data from 71 private sector CIO survey respondents; images: sapannpix/stock.adobe.com. | GAO-22-104603

Notes: The "other" category of officials includes positions such as the president of either the company or one of its business units, the Chief Administrative Officer, the Chief Growth Officer, and the Chief Corporate Operations Officer.

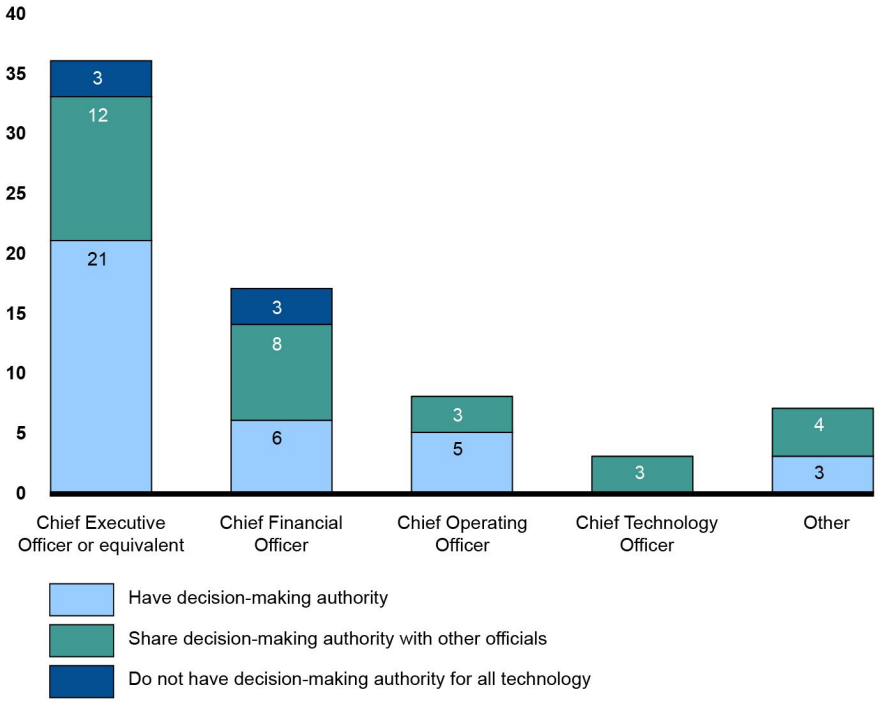
Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

All 71 CIO respondents reported to only one individual.

Private sector CIOs that reported to their company's CEO or COO reported a higher level of autonomy for making all IT-related decisions, and thus less shared decision-making, than CIOs that reported to other executives. For example, 21 of the 36 CIOs, or 58 percent, that reported

to their company's CEO had decision-making responsibility for all IT, while only six of the 17 CIOs, or 35 percent, that directly reported to their company's CFO had that responsibility. Figure 4 shows the percentages of the 71 survey respondents that shared IT decision-making by the type of reporting relationship.

Figure 4: Extent of IT Decision-Making Authority for 71 Private Sector Chief Information Officer (CIO) Respondents by Type of Reporting Relationship



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Accessible Data Table for Figure 4

	Yes	Yes, and I do share	No
CEO (Chief Executive Officer) or equivalent, if no CEO	21	12	3
CFO (Chief Financial Officer)	6	8	3
COO (Chief Operating Officer)	5	3	0
CTO (Chief Technology Officer)	0	3	0
Other	3	4	0

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

Private Sector CIO Respondents Reported Responsibilities Generally Not Applicable to Federal CIOs

The private sector CIOs that we surveyed reported that they were responsible for several IT-related areas beyond the 14 IT management areas that cover agency CIOs' responsibilities. In particular, more than 53 of the 71 private sector CIO respondents, or 75 percent, reported being responsible for each of eight additional areas. Notably, all 71 CIOs reported having responsibility for:

- Engaging in governance and compliance actions regarding IT resources and activities as a result of recent laws and regulations, in areas such as banking and health care,
- IT infrastructure, and
- IT operations and maintenance.

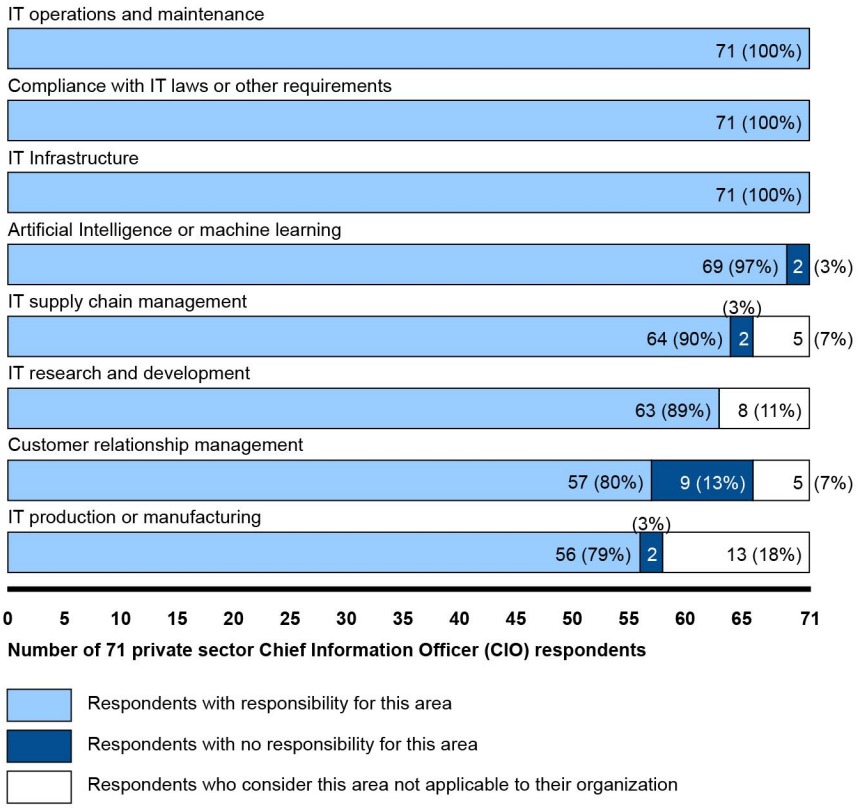
Figure 5 shows the percentage of the 71 private sector CIO respondents that reported having responsibility for each of these eight areas.

Some Chief Information Officer (CIO) Responsibilities Are Unique to Each Organization

Private sector CIOs discussed their responsibilities and how they differed between companies. One private sector CIO stated, "I think even in the private sector, when you ask all of us truly… if we went through our roles and responsibilities right now, that they would be vastly different." This CIO went on to note that CIO roles vary by industry and by company, stating, "I don't think there's any CIO [roles]… that are created equal." For example, some panelists stated that they were responsible for providing regular updates on the state of technology, including the status of cybersecurity, to their companies' board of directors. CIOs said that the boards of directors have increasingly provided resources to address this risk.

Source: GAO expert panel of private sector and former federal agency CIOs. | GAO-22-104603

Figure 5: Extent of Responsibility Reported by 71 Private Sector Chief Information Officers (CIO) in IT Management Areas Not Designated as Agency CIO Responsibilities



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Accessible Data Table for Figure 5

	CIO Has Responsibility For this Area	CIO Does Not Have Responsibility For this Area	Not applicable to the CIO's Organization
IT Operations and Maintenance	71	0	0
Compliance with IT laws or other requirements	71	0	0
IT Infrastructure	71	0	0
Artificial Intelligence or Machine Learning	69	2	0
IT Supply Chain Management	64	2	5
IT Research and Development	63	0	8
Customer Relationship Management (CRM)	57	9	5
IT Production or Manufacturing	56	2	13

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

Each of the eight responsibility areas were not explicitly established for agency CIOs in relevant federal laws and guidance. However, both private sector and former federal agency CIOs in our expert panel reported having responsibilities in three of these areas—customer relationship management, IT infrastructure, and IT operations and maintenance. IT operations and maintenance, in particular, was seen as a crucial responsibility area by both types of CIOs.

Private Sector CIO Respondents Had Comparable Backgrounds and an Average Tenure of About 6 Years

The private sector CIOs that responded to our survey were well-educated, and a majority had IT-related knowledge as well as prior experience in their industry and as CIOs. In their current roles, respondents had an average tenure of about 6 years ranging from 1 to 22 years. CIOs with more authority over technology-related decisions tended to have more years of previous CIO experience and longer tenures as CIOs of their current companies.

Private Sector CIO Respondents Were Highly Educated and Experienced

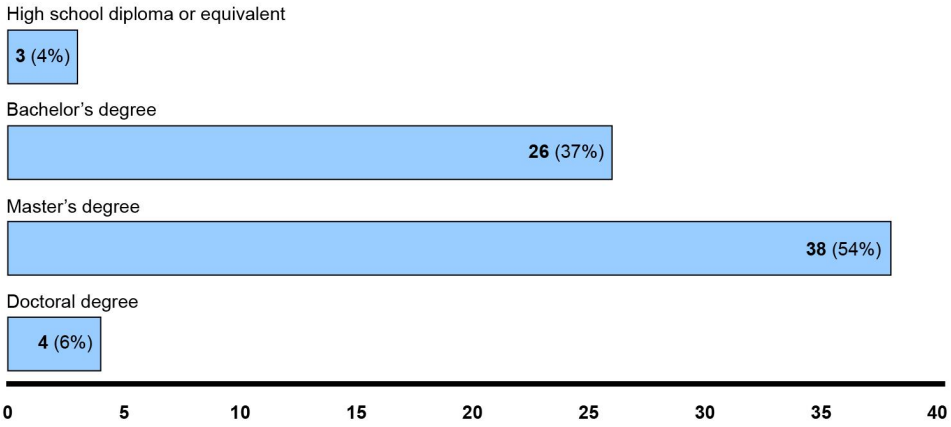
A majority of private sector CIOs responding to our survey reported having college degrees. In particular, 68 of the 71 private sector CIOs, or 96 percent, had at least a bachelor's degree, and 44 of the 71, or 62 percent, had a master's or doctoral degree. Figure 6 shows the levels of education reported by the 71 private-sector CIO survey respondents.

Chief Information Officers (CIO) Encompass a Diversity of Fields of Study

Expert panel participants had a diverse background of educational experiences which evolved over time. One private sector CIO stated "I do not think you need to be the smartest technologist in a room. I think that's how it used to be. The smartest IT guy was the CIO. I think now you just need to know enough to be able to have that dialogue with the direct reports and make sure that you have really smart people reporting to you." In addition, a former federal CIO stated "I certainly do believe there is value in having some kind of undergraduate or graduate technology degree…" Both private and federal CIOs discussed the importance of having IT knowledge, but stressed the importance of having business knowledge and experience. The high portion of CIOs with company or industry knowledge or previous CIO experience was explained by expert panel CIOs, who stated that communication and project management skills, as well as knowledge of the business of their organization, were more central to their success.

Source: GAO expert panel of private sector and former federal agency CIOs. | GAO-22-104603

Figure 6: Reported Education Levels of 71 Private Sector Chief Information Officer (CIO) Respondents



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Accessible Data Table for Figure 6

What is the highest level of education that you (the CIO or an equivalent IT position) have completed?	Number
High school diploma or equivalent	3
Certificate from trade/technical/vocational school	0
Associate's degree	0
Bachelor's degree	26
Master's degree	38
Doctoral degree	4
Professional degree	0

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

While most respondents reported having a college degree, many of those degrees were not IT-related. Specifically, 45 of the 71 private sector CIOs (63 percent) did not hold a degree in an IT-related field prior to starting

their current position. CIOs in our expert panel stated that having an IT degree, while useful, was not essential to success as CIO.

Among respondents, the median CIO with a bachelor's degree had about a half-year less prior CIO experience than CIOs with a master's degree. Table 4 shows the median, minimum, and maximum number of years of experience CIO respondents in each of four education levels had prior to their current role.

Table 4: Median Years of Prior Chief Information Officer (CIO) Experience for 71 Private Sector CIO Respondents Per Education Level

Education level	Number of respondents	Median number of years of prior experience	Minimum number of years of prior experience	Maximum number of years of prior experience
High school diploma	3	5	0	10
Bachelor's degree	26	6.5	0	20
Master's degree	38	7	0	28
Doctoral degree	4	9	3	10

Source: GAO analysis of data from the survey of 71 private sector CIOs. | GAO-22-104603

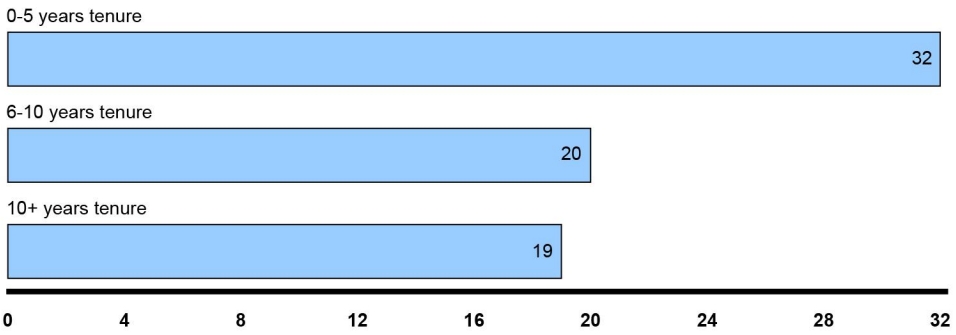
Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

In addition to their formal education, a majority of the 71 private sector CIOs reported having other job-related qualifications at the time of their hire. Specifically, of the 71 CIOs:

- 63, or 89 percent, had some IT-related experience;
- 54, or 76 percent, had some company or industry knowledge; and
- 42, or 59 percent, had previous experience as a CIO.

Prior CIO experience among the respondents ranged from 0 to 28 years of experience. Figure 7 shows the range of prior CIO experience among respondents.

Figure 7: Private Sector Chief Information Officer (CIO) Respondents' Level of Prior CIO Experience



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Accessible Data Table for Figure 7

Years of tenure	Number of year
0-5	32
6-10	20
10 plus	19

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

Among respondents, CIOs with more authority over technology-related decisions tended to have more years of previous CIO experience. Table 5 shows the median, first quartile, and third quartile values for CIO respondents for each of three categories of authority of technology-related decisions.[39] CIOs reporting more authority over technology-related decisions also had a higher median number of years of previous CIO experience.

Table 5: Median Experience of 71 Private Sector Chief Information Officer (CIO) Respondents Based on Reported Authority over Technology-Related Decisions

Reported CIO authority over all technology-related decisions	Number of respondents	Median years of CIO experience	25th percentile	75th percentile
Sole authority	35	10	5.5	12
Shared authority with another person	30	5	1.3	9.5
No authority	6	4	0.8	6.5

Source: GAO analysis of data from the survey of 71 private sector CIOs. | GAO-22-104603

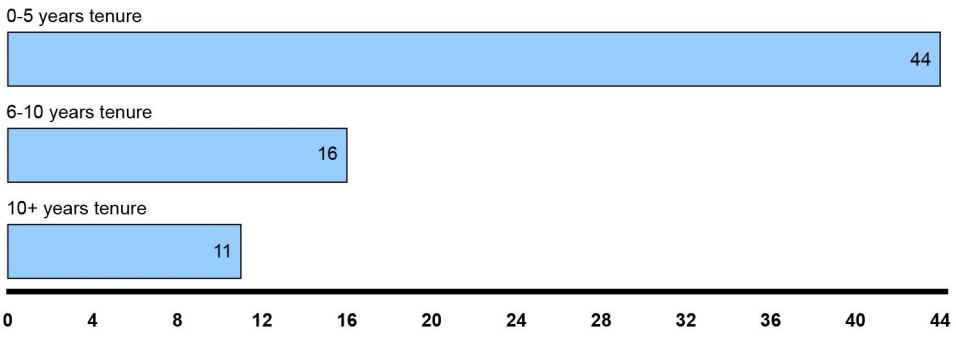
[39]Quartiles are a measure of data in a given population if divided into four equal pieces. Approximately 25 percent of values in a data set are below the first quartile, and 75 percent of values are below the 3rd quartile. The median value is equivalent to the second quartile, with 50 percent of values in a data set below it, and 50 percent above.

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

Private Sector CIO Respondents Had an Average Tenure of About 6 Years

Private sector CIO respondents also varied in their amount of tenure, or years of experience in their current CIO roles. Individual CIO tenures among the 71 respondents ranged from 1 to 22 years. On average, the 71 private sector CIO respondents had just under 6 years of tenure in their current positions, with 44 (62 percent) CIOs having 5 years or less tenure in their current positions, and 11 (15 percent) having 10 years or more tenure. Figure 8 shows the range of tenure among respondents in their current positions.

Figure 8: Private Sector Chief Information Officer (CIO) Respondents' Tenure as CIO



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Accessible Data Table for Figure 8

Years of tenure	Number of year
0-5	44
6-10	16
10 plus	11

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

Respondents with the longest tenures tended to also have more authority over technology-related decisions. In particular, eight of the 11 CIOs with tenures of longer than 10 years had sole authority over technology-related decisions, while only 19 of 44, or 43 percent, of CIOs with 5 years or less of tenure in their current positions had sole authority over these decisions. Table 6 shows the number of CIO respondents with sole,

shared, or no authority over technology decision-making compared to their current tenures.

Table 6: Comparison of IT Decision-Making Authority and Tenure for 71 Private Sector Chief Information Officer (CIO) Respondents

CIO authority over all technology-related decisions	Less than 5 years of tenure at current company	6-10 years of tenure at current company	More than 10 years of tenure at current company
Sole authority	19 (43%)	8 (50%)	8 (73%)
Shared authority with another person	23 (52%)	4 (25%)	3 (27%)
No authority	2 (5%)	4 (25%)	0
Total	**44**	**16**	**11**

Source: GAO analysis. | GAO-22-104603

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

The Federal CIO Position Has Government-wide Responsibilities, but Is Not Defined in Law

The responsibilities currently assigned to the Federal CIO correspond to many of the key IT management areas in which agency CIOs have responsibility. In particular, responsibilities assigned to the Federal CIO generally fell within 10 of the 14 CIO IT management areas. Table 7 shows which of the agency CIO management areas were applicable to the Federal CIO.

Table 7: Coverage of Federal Chief Information Officer (CIO) Responsibilities within 14 IT Management Areas

IT management area	Summary of agency CIO responsibilities	Summary of Federal CIO responsibilities
IT leadership and accountability	• Report to the agency head • Approve bureau CIO selections • Designate a Chief Information Security Officer • Assume control of IT investments	• Sponsor a dialogue among government leaders • Promote innovative use of IT • Chair or hold membership on several IT-related boards • Provide overall leadership and direction to the executive branch on electronic government • Lead the CIO Council • Establish and promote a government-wide program to encourage contractor innovation • Administer the Office of Electronic Government

IT management area	Summary of agency CIO responsibilities	Summary of Federal CIO responsibilities
IT capital planning and investment management	• Advise the agency head on modifications or terminations of projects that include IT • Review and approve IT contracts	• Consult with agency CIOs and program managers regarding risky IT investments • Oversee the implementation of electronic government relating to capital planning and investment control for IT
Information security	• Ensure information security roles are carried out by senior leaders • Ensure that agency personnel are trained to effectively carry out security policies	• Oversee the implementation of electronic government relating to information security • Assist in overseeing agency efforts to ensure that IT activities incorporate adequate, risk-based, and cost-effective security
IT strategic planning	• Establish goals for improving agency operations through IT • Measure organizational IT performance	• Identify, develop, and coordinate multi-agency IT projects and other initiatives • Establish policies for IT standards developed by the National Institute of Standards and Technology • Recommend changes relating to government-wide strategies and priorities for electronic government • Assist in setting strategic direction for electronic government laws and initiatives
IT workforce	• Assess IT skill requirements • Assess IT workforce skills against needs • Develop a strategy to address skills gaps	None
E-commerce/E-business	• Improve agency services to the public using IT	• Sponsor public engagement programs • Assist in administering funding to enable the federal government to conduct activities electronically
Enterprise architecture	• Develop, facilitate, and maintain a sound, secure, and integrated IT architecture	• Oversee the development of enterprise architectures within and across agencies
Information collection	• Review agency data collection proposals to evaluate the need for and burden of collected information	None
Records management	• Ensure that records management policies and procedures are implemented	None
Information dissemination and disclosure	• Ensure information dissemination activities meet agency policy goals	• Oversee the implementation of electronic government relating to access to, dissemination of, and preservation of government information • Implement accessibility standards
Statistical policy	• Ensure the relevance, accuracy, and timeliness of information collected	None
IT budgeting	• Take responsibility for IT planning, programming, and budgeting decisions	• Provide advice on the resources required to develop and effectively administer electronic government initiatives • Oversee the distribution and administration of funds related to electronic government
Systems acquisition, development, and integration	• Assume responsibility and accountability for IT investments	• Work with others to ensure the implementation of electronic procurement initiatives

IT management area	Summary of agency CIO responsibilities	Summary of Federal CIO responsibilities
Privacy	• Comply with privacy-related laws	• Oversee the implementation of electronic government relating to privacy

Legend: Grey shade = responsibilities assigned to the Federal CIO and not applicable to this IT management area.

Source: GAO analysis of federal laws and guidance. | GAO-22-104603

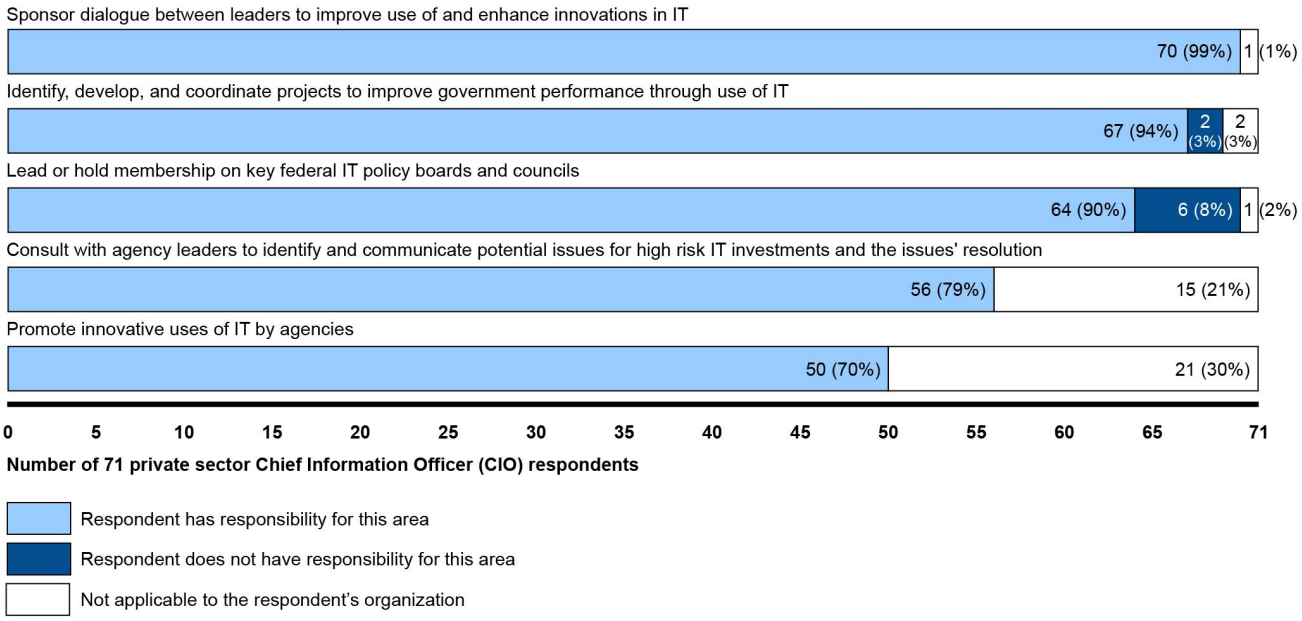
Note: This table represents responsibilities given to the Office of E-Government and Information Technology in laws or to the Federal CIO in subsequent Office of Management and Budget (OMB) guidance. Beyond these, the Federal CIO has additional indirect authorities based on broader authorities given to OMB and the CIO Council, of which the Federal CIO is a part. For example, OMB has various policy and budgetary mechanisms that can affect the IT workforce management area.

The responsibilities currently assigned to the Federal CIO in laws and guidance also generally corresponded to several areas for which private sector CIO respondents have responsibility. Specifically, the Federal CIO had five responsibilities that were directly relevant to the role of private sector CIOs:

- sponsoring dialogue between various relevant stakeholders to improve use of and enhance innovations in IT;
- identifying, developing, and coordinating projects to improve government performance through use of IT;
- leading or holding membership on key federal IT policy boards and councils;
- consulting with agency leaders to identify and communicate potential issues for high-risk investments and the issues' resolutions; and
- promoting innovative uses of IT by agencies.

Among survey respondents, private sector CIO responsibilities regularly overlapped with each of these five. In particular, 61 percent, or 43 of the 71 private sector CIO respondents reported that they had responsibility in each of these five areas. Conversely, several respondents reported some of these responsibilities were not applicable to them. For example, 15 of the 71 respondents reported that responsibilities for consulting with leaders on high-risk investments were not applicable, and 21 of the 71 reported that responsibilities for promoting innovative uses of IT were not applicable. Figure 9 shows the number and percentage of the private sector CIO respondents that reported having responsibility in each of these areas.

Figure 9: Extent of Responsibility for 71 Private Sector Chief Information Officers (CIO) in Five Areas of Federal CIO Responsibility



Source: GAO analysis of data from 71 private sector CIO survey respondents. | GAO-22-104603

Accessible Data Table for Figure 9

	Has	Does Not	N/A
Sponsor dialogue between leaders to improve use of and enhance innovations in IT	70	0	1
Identify, develop, and coordinate projects to improve government performance through use of IT	67	2	2
Lead or hold membership on key federal IT policy boards and councils	64	6	1

	Has	Does Not	N/A
Consult with agency leaders to identify and communicate potential issues for high risk IT investments and the issues' resolution	56	0	15
Promote innovative uses of IT by agencies	50	0	21

Note: Survey results are from a non-probability sample and may not generalize to all private sector CIOs.

However, because the Federal CIO position has not been established in law, its IT management responsibilities are often more limited than those of other types of CIOs. Its responsibilities contain a mix of more general responsibilities, including those established in law prior to the Federal CIO position's designation in 2009 and assigned to the OMB Director or the OMB Administrator of the Office of E-Government and Information Technology, and those given to the Federal CIO in OMB guidance and tied to specific initiatives subsequent to 2009.

In part due to this, the Federal CIO responsibilities assigned in law were less specific within some individual management areas, often involving providing high-level advice, coordination, or support, in contrast to the more directly involved roles of agency and private sector CIOs. For example:

- Agency and private sector CIOs are required to ensure that senior leaders are carrying out cybersecurity duties, while the Federal CIO is responsible for assisting in the oversight of agencies' IT security activities.
- Laws require agency CIOs to assume responsibility and accountability for IT investments, while the Federal CIO is required only to consult with agency CIOs and program managers regarding risky IT investments.
- As part of ensuring they are responsible and accountable for the effective implementation of IT management responsibilities, legislation requires agency CIOs to report directly to their agency's head; OMB guidance interprets this provision to allow agency CIOs to also report to their agency's deputy head. Similarly, 44 of the 71 private sector CIO survey respondents reported to their company's CEO or COO.

The Federal CIO does not have this requirement, reporting to OMB's Deputy Director for Management, who in turn reports to the OMB Director within the White House.[40]

In our most recent high-risk report, we reported that it is necessary for OMB to provide sustained oversight and leadership commitment to ensure that key improvements in government-wide IT management areas were carried out.[41] The Federal CIO has received, in subsequent White House guidance, some specific IT management responsibilities tied to government-wide initiatives.[42] However, its broader authorities remain those established in the E-Government Act of 2002 for the OMB position from which the Federal CIO role was created, which are largely high-level and managerial in nature. Due to this, there is uncertainty regarding how much authority the Federal CIO position has, or will have in the future, to fulfill the IT management responsibilities commonly expected of a CIO. By establishing the Federal CIO in law and addressing such responsibilities, the authorities of the position can be clarified and will be consistent over time and across administrations.

Agencies Could Emulate Private Sector Emphasis on Shared Accountability and Improved CIO Managerial Skills

Former federal agency CIOs participating in an expert panel discussion noted challenges they faced in performing their responsibilities, including sufficient cross-organizational communication in meeting agency goals and ensuring that CIOs had the managerial skills needed to be successful

[40]The Deputy Director for Management is a Senate confirmed senior leadership position within OMB. The Deputy Director for Management also serves as the nation's federal Chief Performance Officer. According to OMB, the Deputy Director for Management/Chief Performance Officer is to develop and execute a government-wide management agenda that includes IT, financial management, procurement, performance, and human resources.

[41]GAO, *High-Risk Series: Dedicated Leadership Needed to Address Limited Progress in Most High-Risk Areas,* GAO-21-119SP (Washington, D.C.: Mar. 2, 2021).

[42]For example, in 2012, the Federal CIO was tasked with developing a comprehensive strategy to better deliver digital services to the American people, and in 2015, it was tasked with establishing a dedicated team to oversee agency and government-wide cybersecurity programs.

in their position.[43] In areas such as these, private sector CIO panelists also discussed ways in which companies have met similar challenges. Private sector CIOs' experiences in meeting these challenges may offer opportunities for agency CIOs to also address them.

Shared Accountability Could Help IT Support Agency Goals

We have previously reported that federal agencies must make effective use of partnerships to optimize their contributions to achieving outcomes, including sharing accountability for results and establishing networks for the sharing of knowledge.[44] In addition, private sector CIO panelists stated that a critical factor for a CIO's success is an ability to bridge gaps between the technical and business parts of the company and promote two-way information exchange. As previously noted, private sector CIO panelists also stated that the concept of shared accountability was a key part of their business culture. Participants also viewed collaboration between the CIO and other business-centric senior executives as essential, and stated that cross-functional teams often must work together to drive business outcomes, such as increasing revenue and customer satisfaction.

Private sector CIOs' survey responses echo this focus on shared accountability. For example, a high percentage of the 71 private sector CIO respondents have shared responsibility in making decisions in several key IT areas. This includes information management areas like information collection (where 49 CIOs, or 69 percent, of CIOs reported sharing responsibility); records management (57 CIOs, or 80 percent); and privacy (55 CIOs, or 77 percent). It also includes other areas, such as IT capital planning and investment management (32 CIOs, or 45 percent) and IT strategic planning (21 CIOs, or 30 percent).

Conversely, former federal agency CIO panelists stated that they had difficulty achieving meaningful collaboration with other senior executives

[43]These issues are long-standing challenges for federal government CIOs. In 2004, CIOs at a similar GAO-led expert panel also reported difficulties in establishing structures that ensure effective communication cross-organizationally, and in developing project management skills. See GAO-04-823.

[44]GAO, *High-performing Organizations: Metrics, Means, and Mechanisms for Achieving High Performance in the 21st Century Public Management Environment,* GAO-04-545SP (Washington, D.C.: Feb. 13, 2004).

to meet organizational goals, in part because funding for IT was not as tied to specific organizational priorities. Requirements in laws and guidance also largely focus on giving specific responsibilities to CIOs alone. For example, of 22 requirements given to CIOs in law and guidance, only three state that CIOs should collaborate with other senior executives, such as the CFO or Chief Human Capital Officer, in IT management areas such as budgeting and workforce initiatives. The current Federal CIO noted that voluntary collaboration between CIOs and other executives is crucial and even more valuable than roles assigned through legislation in successfully completing IT initiatives.

Panelists stated that federal agencies have an organizational culture where the CIO does not have sufficient visibility with executive decision makers, and cannot regularly share knowledge and information with other executives. Furthermore, panelists stated that differing definitions of IT can result in the appropriation of funding for technology to divisions outside the purview of the CIO. Without shared accountability with other senior executives, it can be difficult for agency CIOs to secure resources for IT initiatives that meet the agency's goals.

Additional Focus on Managerial Skills Could Aid IT Priorities

According to GAO standards for internal control, to help an organization achieve its objectives, management should establish expectations of competence for key roles, such as a CIO.[45] Competence requires relevant knowledge, skills, and abilities, which are gained largely from professional experience, among other things. Similarly, the Office of Personnel Management has found that identifying critical skills and competencies that will be needed to achieve current and future programmatic results is a key practice in building an effective workforce.[46]

Private sector CIO panelists stated that they look for both technical skills and managerial skills when hiring CIOs. For example, private sector CIO

[45]GAO, *Standards for Internal Control in the Federal Government,* GAO-14-704G (Washington, D.C.: Sept. 2014).

[46]Office of Personnel Management, The Human Capital Assessment and Accountability Framework (https://www.opm.gov/policy-data-oversight/human-capital-framework). The Office of Personnel Management defines a competency as a measurable pattern of knowledge, skills, abilities, behaviors, and other characteristics that an individual needs to successfully perform a work role or occupational function.

panelists stated that they look for communication skills to advocate for IT initiatives and project and program management skills to effectively implement the initiatives.

In addition, in order to better ensure that CIOs are able to align IT to the organization's business goals, panelists stated that it was important for CIO candidates to have an understanding of their organization or industry. The current Federal CIO also stated that managerial skills were key to the success of federal CIOs. Managerial skills mentioned by the Federal CIO included a detailed understanding of both IT and non-IT aspects of the organization's mission, an ability to communicate the relevancy of IT initiatives to other leaders, and an ability to build relationships and create partnerships.

Similarly, information from the 71 private sector CIO survey respondents and private sector CIO panelists provides further insight into the importance of managerial skills. As stated earlier, 45 private sector CIO respondents, or 63 percent, reported that they did not hold a degree in an IT-related field prior to starting their current position. Fifty-four private sector CIO respondents, or 76 percent, reported having some company or industry knowledge at the time of their hire.

In contrast, former agency CIO panelists stated that technical skills, rather than the managerial skills mentioned previously, are often the primary driver in the selection of agency CIOs. Panelists pointed to factors such as career CIOs being promoted from parts of the organization that are more technology focused, or CIOs being appointed to deliver specific short-term technology deliverables based on the political needs of agency leadership. Without greater consideration of a broader skillset when hiring CIOs, federal agencies may continue to be challenged when implementing key IT priorities.

Conclusions

Congress established the federal agency CIO position to serve as a focal point for addressing longstanding IT challenges. Over the past several decades, statutes and OMB have assigned many IT management responsibilities to federal agency CIOs. The responsibilities of 71 private sector survey respondents largely match those of agency CIOs in key IT management areas in laws and guidance.

Responsibilities currently given to the Federal CIO correspond to those of agency and private sector CIOs in many key CIO IT management areas. However, the Federal CIO position is not established in law. Instead, many of its responsibilities fulfill the statutory duties of the OMB position from which the role was established. As a result, its IT management responsibilities are often more limited than those of other types of CIOs, and there is uncertainty regarding the extent to which Federal CIO authorities fulfill the IT management responsibilities commonly expected of a CIO. By formalizing the Federal CIO position and establishing responsibilities and authorities over government-wide IT management, the position's impact over federal IT may be more consistent over time and across administrations.

Federal agencies can emulate private sector practices in addressing several current challenges facing agency CIOs. In particular, private sector and former federal agency CIO expert panelists pointed to challenges in sharing responsibility and authority with other executives on joint IT initiatives, and in considering managerial skills when hiring CIOs. Panelists also discussed ways in which private sector companies have met similar challenges. Having the Federal CIO foster increased shared collaboration and improved managerial skillsets for agency CIOs could assist federal agencies and their CIOs in implementing IT priorities that fulfill the agencies' missions.

Matter for Congressional Consideration

Congress should consider formalizing the Federal CIO position and establishing responsibilities and authorities for government-wide IT management. (Matter for Consideration 1)

Recommendations for Executive Action

We are making the following two recommendations to OMB:
The Director of OMB should direct the Federal CIO to increase emphasis placed on shared collaboration between agency CIOs and other senior executives to accomplish agency-wide and government-wide goals. (Recommendation 1)

The Director of OMB should direct the Federal CIO to take steps to ensure that managerial skills, such as communication and program

management skills, have an appropriate role in the hiring criteria for agency CIOs. (Recommendation 2)

Agency Comments

We provided a draft of this report to OMB for review and comment. OMB did not agree or disagree with our recommendations, but provided technical comments that we incorporated as appropriate.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until the day after the report date. At that time, we will send copies to the appropriate congressional committees, the Director of OMB, and other interested parties. In addition, the report will be available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-6151 or walshk@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff making key contributions to this report are listed in appendix IV.

Kevin Walsh
Director, Information Technology and Cybersecurity

Appendix I: Survey Questions Administered to Private Sector CIOs and the Responses for Each Question

We administered a web-based survey to private sector Chief Information Officers (CIO) or an equivalent position. The survey was administered to determine the responsibilities, qualifications, and tenure of the responding CIOs. The following sections identify the survey questions that we administered and the aggregated results from the responses under each question. Seventy-one CIOs responded to the survey. Narrative answers to open ended text questions are not displayed below for brevity and to limit the possibility of identification of individual CIOs.

Survey of Private Sector CIOs' Responsibilities, Qualifications, and Tenure

U.S. Government Accountability Office

Introduction

We need your help to assist Congress in making federal IT management more efficient in the interest of the American public.

We are currently conducting a study to describe the responsibilities, qualifications, and tenure of Chief Information Officers (CIO) in the private sector and how they compare to their federal counterparts. This study is being done at the request of the House Committee on Oversight and Reform's Subcommittee on Government Operations. To respond to the congressional request, we are surveying the CIOs (or the person performing the duties of the CIO) at several randomly-selected companies with budgets and number of employees similar to those of federal agencies.

You were identified as the CIO of your company or the person performing the duties of your company's CIO. If that is not you, and you have not been asked to fill out this survey on behalf of the CIO, please call or email

GAO as soon as possible using the contact information below and do NOT complete the survey. If the CIO has asked you to fill out this survey, we will request that the CIO review and approve the responses before they are submitted to GAO.

Your responses will assist Congress by providing invaluable insights that will enhance future discussion and legislation about the role of federal CIOs. In addition, if you complete the survey, we will email you a link to our report when it is issued. The report will provide summary statistics on the CIO experiences at companies like yours and may be of interest and value to you and your company. Also, if you complete the survey, you will have the option to have us recognize your company in the report as a contributor. Your contribution to this survey effort would be of great benefit to GAO, Congress, and ultimately, the American public.

We are not evaluating your company. In our report to Congress, we will use only the aggregated results of this survey across hundreds of companies. The survey results we report will not identify you individually or your company. We take steps to secure your survey response data as described here. Additionally: We use Qualtrics survey software, which has FedRAMP approval, and uses HTTPS data encryption. An overview of Qualtrics' security features is here. To further protect the data while the survey is ongoing, we only disclose the survey URL to respondents and our staff working on the project and we give respondents a unique link that allows them to access only their survey information. All data files that we obtain using a web survey become part of our audit documentation. For more information on how we protect these records, see Public Access to GAO Records.

This survey is estimated to take about 20 minutes. You can save your responses and finish later if needed.

Thank you in advance for your time and consideration.

Section I: CIO Background Information

1. Are you the CIO — or in an equivalent position if your company does not have a CIO — or are you someone else filling out the survey on behalf of the CIO?

Number of Responses	
I am the CIO or in an equivalent position	67
I am filling the survey out on behalf of the CIO	4
No answer	0

2. **Please provide the following information if you are filling out this survey on behalf of the CIO.** We will only use contact information for follow-up communications and will not distribute it outside of GAO. (Note – open ended text responses deliberately omitted)

3. **Please provide the following information about the CIO or equivalent position.** We will only use contact information for follow-up communications and will not distribute it outside of GAO. (Note – open ended text responses deliberately omitted)

NOTE: If you are filling out this survey on behalf of the CIO or equivalent position, please answer the remaining questions accurately on behalf of that person.

4. **What is the highest level of education that you (the CIO or an equivalent IT position) have completed?** If you are currently enrolled, please provide the highest level completed. *Select one.*

Number of Responses	
High school diploma or equivalent	3
Certificate from trade/technical/vocational school	0
Associate's degree	0
Bachelor's degree	26
Master's degree	38
Doctoral degree	4
Professional degree	0
No answer	0

5. **How long have you served as CIO (or an equivalent IT position) at your current company?** Please round to the nearest number of years. (Note – open ended text responses deliberately omitted)

6. **In total, how many years of experience did you have as a CIO (or an equivalent IT position) prior to the position at your current company?** Please round to the nearest number of years. (Note – open ended text responses deliberately omitted)

7. **When you were hired as CIO (or an equivalent IT position) at your current company, which of the following qualifications did you have?** *Select all that apply.*

	Number of Responses
Degree in an IT-related field	26
IT-related experience	63
CIO experience	42
Company or industry knowledge	54
Other	7

8. **Were you an internal or external hire when you became CIO (or an equivalent IT position) at your current company?** *Select one.*

Number of Responses	
Internal: I was working for this company when I was hired for my current position	32
External: I was not working for this company when I was hired for my current position	39
Other (please specify)	0
No answer	0

9. **To whom do you (the CIO) directly report?** *Select all that apply.*

Number of Responses	
CEO (Chief Executive Officer) or equivalent, if no CEO	36
COO (Chief Operating Officer)	8
CFO (Chief Financial Officer)	17
CTO (Chief Technology Officer)	3
Other (please specify)	7
No answer	0

10. **Do you have the authority to make decisions regarding all of the company's technology, including operational technology and information technology?** *Select one*.

Number of Responses	
Yes, and I **do not** share this authority with another person(s)	35
Yes, and I **do** share this authority with another person(s) other than my staff	30
No	6
No answer	0

If No, please provide details on the technology over which you do *not* have authority: (Note – open ended text responses deliberately omitted)

Section II: CIO Roles and Responsibilities

Questions in this section are intended to collect information regarding your specific roles and responsibilities within the following functional areas

Information Technology Leadership and Accountability

11. **Do you have the responsibility for activities regarding 'IT leadership and accountability' at your company?** This includes activities such as being responsible and accountable for the effective implementation of IT management responsibilities. For example, do you, as CIO, establish the organizational policies and processes by which the company makes decisions about its information and technology assets and are you involved in the IT governance process, including executive committees, steering committees, and oversight committees? *Select one.*

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	59
Yes, and I **do** share this responsibility with another person(s) other than my staff	12
No	0
Not applicable	0
No answer	0

12. **Some companies have CIOs for each of their divisions or components. Are you responsible for approving the selection of your company's division or component CIOs (or equivalent position(s))?** A division or component operates as part of the parent company with a different name. If your company does not have divisions or components, please select "Not applicable." *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	25
Yes, and I **do** share this responsibility with another person(s) other than my staff	17
No	1
Not applicable	28
No answer	0

13. **Are you responsible for approving the selection of your company's chief information security officer (or equivalent position)?** If your company does not have a chief information security officer (or equivalent position), please select "Not applicable." *Select one*.

Number of Responses

Yes, and I **do not** share this responsibility with another person(s) other than my staff	47
Yes, and I **do** share this responsibility with another person(s) other than my staff	19
No	4
Not applicable	1
No answer	0

14. **Are you responsible for bringing varying levels of leadership within your company together to enhance the understanding of best practices and innovative uses of IT?** *Select one.*

Number of Responses

Yes, and I **do not** share this responsibility with another person(s) other than my staff	53
Yes, and I **do** share this responsibility with another person(s) other than my staff	17
No	0
Not applicable	1
No answer	0

15. **Are you responsible for encouraging innovative uses of IT by your company's division/component CIOs? I**f your company does not have divisions or components, please select "Not applicable." *Select one*.

Number of Responses

Yes, and I **do not** share this responsibility with another person(s) other than my staff	27
Yes, and I **do** share this responsibility with another person(s) other than my staff	23
No	0
Not applicable	21
No answer	0

16. **Are you responsible for serving as a chair or member of a board or council (e.g., advisory boards, working groups, governance boards, policy groups, or executive councils) related to IT at your company?** *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	35
Yes, and I **do** share this responsibility with another person(s) other than my staff	29
No	6
Not applicable	1
No answer	0

IT Capital Planning and Investment Management

17. **Do you have the responsibility for activities regarding 'IT capital planning and investment management' at your company?** This includes activities such as being responsible for the processes for managing, controlling, evaluating, and assessing how well the company is managing its IT resources and investments and/or having a significant role in IT execution decisions and the management, governance, and oversight processes related to IT. *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	39
Yes, and I **do** share this responsibility with another person(s) other than my staff	32
No	0
Not applicable	0
No answer	0

18. **Are you responsible for advising the CEO or equivalent on whether to continue, modify, or terminate any acquisition, investment, or activity that includes a significant IT component?** *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	26
Yes, and I **do** share this responsibility with another person(s) other than my staff	42
No	3
Not applicable	0
No answer	0

19. **Are you responsible for approving IT contracts, acquisition plans, or strategies?** *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	46
Yes, and I **do** share this responsibility with another person(s) other than my staff	25
No	0
Not applicable	0
No answer	0

20. **Are you responsible for consulting with your company's division/component CIOs (or equivalent officials) or other relevant managers of IT investment projects when a project is high risk (for example: complex, large-scale, or high-visibility projects, or those facing significant threats)?** *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	31
Yes, and I **do** share this responsibility with another person(s) other than my staff	25
No	0
Not applicable	15
No answer	0

Information Security

21. **Do you have the responsibility for activities regarding 'information security' at your company?** This includes activities such as being responsible for establishing, implementing, and ensuring compliance with a company-wide information security program, including policies, procedures, and control techniques, and protecting information and systems against unauthorized disclosure, transfer, modification, or destruction, whether accidental or intentional. *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	46
Yes, and I **do** share this responsibility with another person(s) other than my staff	22
No	3
Not applicable	0
No answer	0

22. **Are you responsible for ensuring that senior company officials, including your company's division/component CIOs or equivalent officials, carry out their information security responsibilities?** *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	45
Yes, and I **do** share this responsibility with another person(s) other than my staff	19
No	2
Not applicable	5
No answer	0

23. **Are you responsible for ensuring that company personnel, including those with significant responsibility for information security, are trained to effectively carry out information security policies, procedures, and control techniques?** *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	46
Yes, and I **do** share this responsibility with another person(s) other than my staff	22
No	3
Not applicable	0
No answer	0

IT Strategic Planning

24. **Do you have the responsibility for activities regarding 'IT strategic planning' at your company?** This includes activities such as being responsible for strategic planning for all IT management functions, including long-term objectives, plans for achieving these objectives, and ways of measuring success in meeting objectives. *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	50
Yes, and I **do** share this responsibility with another person(s) other than my staff	21
No	0
Not applicable	0
No answer	0

25. **Are you responsible for establishing goals for improving company operations through IT?** *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	38
Yes, and I **do** share this responsibility with another person(s) other than my staff	31
No	2
Not applicable	0
No answer	0

26. **Are you responsible for measuring how well IT supports company programs (e.g., scorecards or satisfaction surveys)?** *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	50
Yes, and I **do** share this responsibility with another person(s) other than my staff	21
No	0
Not applicable	0
No answer	0

27. **Are you responsible for identifying, developing, and coordinating projects across multiple divisions or components to improve your company's performance through the use of IT? I**f your company does not have divisions or components, please select "Not applicable." *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	35
Yes, and I **do** share this responsibility with another person(s) other than my staff	32
No	2
Not applicable	2
No answer	0

IT Workforce

28. **Do you have the responsibility for activities regarding the 'IT workforce' at your company?** This includes activities such as being responsible for assessing company IT workforce needs and developing strategies and plans for meeting those needs, including the processes, policies, and activities used for the management of people as strategic assets, including recruitment, retention and training. *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	50
Yes, and I **do** share this responsibility with another person(s) other than my staff	21
No	0
Not applicable	0
No answer	0

29. **Are you responsible for regularly assessing the requirements for company personnel regarding IT knowledge and skills?** *Select one*.

Number of Responses	
Yes, I **do** regularly assess the requirements and I do not share this responsibility with another person(s) other than my staff	45
Yes, I **do** regularly assess the requirements and I share the responsibility with another person(s) other than my staff	25
No, I am not responsible for regularly assessing the requirements	0
Not applicable	0
No answer	1

30. **Are you responsible for regularly assessing the extent to which company personnel meet your company's IT knowledge and skills requirements?** *Select one*.

	Number of Responses
Yes, I **do** regularly assess the requirements and I do not share this responsibility with another person(s) other than my staff	45
Yes, I **do** regularly assess the requirements and I share the responsibility with another person(s) other than my staff	24
No, I am not responsible for regularly assessing the requirements	0
Not applicable	0
No answer	2

31. **Are you responsible for developing strategies regularly for hiring to address any IT knowledge and skill gaps among your company's personnel?** *Select one*.

	Number of Responses
Yes, and I **do not** share this responsibility with another person(s) other than my staff	35
Yes, and I **do** share this responsibility with another person(s) other than my staff	36
No	0
Not applicable	0
No answer	0

32. **Are you responsible for developing strategies regularly for training to address any IT knowledge and skill gaps among your company's personnel?** *Select one*.

	Number of Responses
Yes, and I **do not** share this responsibility with another person(s) other than my staff	43
Yes, and I **do** share this responsibility with another person(s) other than my staff	28
No	0
Not applicable	0
No answer	0

E-commerce/E-business

33. **Do you have the responsibility for activities regarding 'e-commerce/e-business' at your company?** This includes activities such as being responsible for using IT for the sale or purchase of goods and services, including business-to-business, business-to-consumer, and internal transactions. *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	13
Yes, and I **do** share this responsibility with another person(s) other than my staff	46
No	7
Not applicable	5
No answer	0

Information Collection

34. **Do you have the responsibility for activities regarding 'information collection' at your company?** This includes activities such as being responsible for ensuring the quality, utility, and clarity of any information to be collected (e.g. online, internally, or externally). Information is any communication or representation of knowledge such as facts, data, or opinions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual. *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	12
Yes, and I **do** share this responsibility with another person(s) other than my staff	49
No	8
Not applicable	2
No answer	0

Records Management

35. **Do you have the responsibility for activities regarding 'records management' at your company?** This includes activities such as being responsible for a planned, coordinated set of policies, procedures, and activities used to manage a company's recorded information and encompasses the creation, maintenance and use, long-term storage, and disposition of records (e.g. technical, financial, or personnel), regardless of media. *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	4
Yes, and I **do** share this responsibility with another person(s) other than my staff	57
No	10
Not applicable	0
No answer	0

Information Dissemination and Disclosure

36. **Do you have the responsibility for activities regarding 'information dissemination and disclosure' at your company?** This includes activities such as being responsible for providing access to the company's information for purposes of, for example, legal compliance, marketing, or customer service. Information is any communication or representation of knowledge such as facts, data, or opinions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual. *Select one*.

Number of Responses	
Yes, and I **do not** share this responsibility with another person(s) other than my staff	4
Yes, and I **do** share this responsibility with another person(s) other than my staff	55
No	12
Not applicable	0
No answer	0

Statistical Policy

37. **Do you have the responsibility for activities regarding 'statistical policy' at your company?** Statistical policy includes being responsible for the processes, policies, and activities used to ensure the relevance, accuracy, integrity, timeliness, and objectivity of information collected or created for statistical purposes. *Select one*.

Number of Responses

Yes, and I **do not** share this responsibility with another person(s) other than my staff	4
Yes, and I **do** share this responsibility with another person(s) other than my staff	28
No	30
Not applicable	9
No answer	0

Other Areas

38. **Do you have the responsibility for activities regarding the following areas?** *Select one for each row*.

Number of Responses

	Yes, and not shared with another person(s) other than my staff	Yes, and shared with another person(s) other than my staff	No	Not applicable	No Answer
IT Budgeting	49	22	0	0	0
IT Systems Acquisition	54	17	0	0	0
IT Systems Development	58	13	0	0	0
IT Systems Integration	59	12	0	0	0
Enterprise Architecture	67	4	0	0	0
Privacy	7	55	9	0	0
Artificial Intelligence or Machine Learning	27	42	2	0	0
Compliance with IT laws or other requirements (e.g., Sarbanes-Oxley Act, Health Insurance Portability and Accountability Act (HIPAA))	16	55	0	0	0
Customer Relationship Management (CRM)	20	37	9	5	0
IT Infrastructure	66	5	0	0	0
IT Operations and Maintenance	62	9	0	0	0
IT Production or Manufacturing	42	14	2	13	0
IT Research and Development	46	17	0	8	0
IT Supply Chain Management	37	27	2	5	0

39. **If you have any other responsibilities as the CIO (or an equivalent IT position) other than those we have asked about in this survey, please list them here:** (Note – open ended text responses deliberately omitted)

Section III: Panel and Acknowledgments

In addition to this survey, we plan to conduct individual interviews with volunteer CIOs or hold a panel with private sector CIOs, former federal CIOs, and subject matter experts to fully understand all the responses we receive from this survey. If you (the CIO or an equivalent IT position) would be willing to participate in the panel or an individual interview to discuss your survey responses, please let us know below. Checking one of the boxes below does not obligate you to either activity but tells us that you are willing and would like to be considered. We will select participants for interviews and the panel from all volunteers. If you are selected, we will contact you to confirm your availability before scheduling a meeting.

40. **Would you be willing to participate in the panel, an individual interview, or either?** *Select one*.

Number of Responses	
Individual interview but not a panel	13
Panel but not an interview	0
Either an individual interview or a panel	41
None of the above	11
No answer	0

41. **If someone other than the CIO (or an equivalent IT position) filled out the survey on behalf of the CIO, we would like to ensure the final survey responses were reviewed and approved by the CIO (or an equivalent IT position) before submission to GAO. Were the responses you are submitting approved by the CIO?** *Select one.*

	Number of Responses
Yes, the responses were reviewed and approved by the CIO (or an equivalent IT position)	2
No, the responses were not reviewed and approved by the CIO (or an equivalent IT position)	2

42. **If you would like, your company will be publicly recognized as a contributor to our survey results within our final report. Please let us know if your company would like to be acknowledged.** *Select one.*

	Number of Responses
Acknowledge by company name	23
Do not acknowledge by company	48
No answer	0

Appendix II: Participants in the Pretest, Survey, and Expert Panel

In September and October 2021, we held four survey pretests with private sector Chief Information Officers (CIO). The purpose of the survey pretests was to gain insight on the draft questions and estimated time to complete the survey. Table 8 lists the participants in the survey pretests.

Table 8: Survey Pretest Participants

Name	Company	Title
Michael Josephs	American Advisors Group	Chief Information Officer (CIO)
David Kueffner	Clover Imaging	Acting CIO
Mani Sundaram	Akamai	CIO
Greg Taffet	N/A	CIO

Source: GAO survey pretest information. | GAO-22-104603

Table 9 provides the list of 23 companies where the CIO completed our survey and indicated they wished to be acknowledged. The other 48 companies that completed our survey did not wish to be acknowledged by name in our report.

Table 9: Companies of Survey Respondents That Wished to Be Acknowledged

Companies	
Advanced Micro Devices, Inc.	Owens Corning
AMN Healthcare Services, Inc.	Portland General Electric Co.
Avnet, Inc.	Puget Energy, Inc.
Cerner Corporation	Sanmina Corporation
Delta Air Lines, Inc.	Science Applications International Corporation
Global Payments Inc.	Sonoco Products Company
Huntington Ingalls Industries, Inc.	The Interpublic Group of Companies, Inc.
Kemper Corporation	Union Pacific Corporation
KeyCorp	Verisk Analytics, Inc.
Lennox International Inc.	Waste Management, Inc.
Marsh & McLennan Companies, Inc.	Yum! Brands, Inc.

Northwestern Mutual Life Insurance Company

Source: GAO analysis of survey data. | GAO-22-104603

In January 2022, we convened two panels of private sector and former agency CIOs. During the panel, we discussed CIOs' roles and responsibilities, qualifications and tenure. Table 10 provides the panel participants, all of whom indicated they wished to be acknowledged.

Table 10: Private Sector and Former Agency Chief Information Officers (CIO) Panel Participants

Name	Company/former agency	Title(s)
January 12, 2022		
Amy Brady	KeyCorp	CIO
Casey Coleman	General Services Administration	CIO
Karen Evans	Department Homeland Security; Office of Management Budget; Department of Energy	CIO; former Federal CIO
Max Everett	Department of Energy	CIO
Bill Graff	Cerner Corporation	CIO
Rahul Jalali	Union Pacific Corporation	Senior Vice President and CIO
Richard Spires	DHS; Internal Revenue Service	CIO
Ryan Talbott	BorgWarner Inc.	Vice President and CIO
Rusty Yeager	Encompass Health Corporation	Senior Vice President and CIO
January 14, 2022		
Jonathan Alboum	Department of Agriculture	CIO
Corrado Azzarita	The Kraft Heinz Company	Global CIO
Paul Beswick	Marsh & McLennan Companies, Inc.	Senior Vice President and CIO
Jim Gfrerer	Veterans Affairs	CIO
Richard Gius	Atmos Energy Corporation	Vice President and CIO
Patricia Hinerman	The Interpublic Group of Companies, Inc.	CIO
David Kotch	FMC Corporation	Vice President and CIO
Manesh Patel	Sanmina Corporation	Senior Vice President and CIO
George Reichert	Enact Mortgage Insurance	CIO
Renee Wynn	National Aeronautics and Space Administration	CIO

Source: GAO CIO expert panel information. | GAO-22-104603

Appendix III: Objectives, Scope, and Methodology

Our objectives were to determine (1) the responsibilities of selected chief information officers (CIO) in the private sector and how they compare to the responsibilities of federal agency CIOs; (2) the qualifications and tenure of selected CIOs in the private sector and how they compare to those of federal agency CIOs; (3) the responsibilities of the Federal CIO and how they compare with those of federal agency and private sector CIOs; and (4) how private sector CIO experiences can be applied to the challenges facing federal agency CIOs.

To address all of our objectives, we (1) identified a comprehensive list of federal agency CIO and Federal CIO responsibilities for comparison with those of the CIOs in the private sector; (2) selected a non-generalizable sample of private sector companies similar in size and revenue to the 24 federal agencies covered under the Chief Financial Officers Act of 1990 to include in a survey;[1] (3) created, pretested, and administered a survey instrument on responsibilities, qualifications, and tenure to selected private sector CIOs; and (4) organized and held two expert panels with selected private sector CIOs and former federal agency CIOs to gain any clarifications needed on our survey data and preliminary observations. The following provides details on each of these four steps, as well as how their results were used to complete each of our four objectives.

[1]These agencies were the Departments of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, the Interior, Justice, Labor, State, Transportation, the Treasury, and Veterans Affairs; the Environmental Protection Agency; General Services Administration; National Aeronautics and Space Administration; National Science Foundation; Nuclear Regulatory Commission; Office of Personnel Management; Small Business Administration; Social Security Administration; and the U.S. Agency for International Development.

Step 1: Identifying a comprehensive list of responsibilities of federal agency CIOs and the Federal CIO

To identify a comprehensive list of responsibilities of federal agency CIOs and the Federal CIO, we analyzed laws and guidance from the past several decades specifying the roles and responsibilities of government officials, including the roles and responsibilities of agency CIOs, such as:

- the Paperwork Reduction Act;[2]
- the Clinger-Cohen Act of 1996;[3]
- the Federal Information Security Management Act of 2002[4] and its successor the Federal Information Security Modernization Act of 2014;[5]
- the E-Government Act of 2002;[6]
- the Office of Management and Budget's (OMB) *Management and Oversight of Federal Information Technology,* Memorandum M-15-14;[7] and

[2]44 U.S.C. §§ 3501-3521. The Paperwork Reduction Act of 1980 required that each agency head designate a senior official who would directly report to the head to be responsible for the management of the agency's information systems. Pub. L. No. 96-511, § 2, 94 Stat. 2812, 2819 (1980). The Paperwork Reduction Act of 1995 amended the original act to place the management of IT under the umbrella of information resources management. Pub. L. No. 104-13, 109 Stat. 163 (1995).

[3]Pub. L. No. 104-106, §§ 5001-5703, 110 Stat. 186, 679-703, (1996) (codified, as amended, at 40 U.S.C. §§ 11101-11703).

[4]Pub. L. No. 107-347, §§ 301-05, 116 Stat. 2899, 2946-61.

[5]Pub. L. No. 113-283, 128 Stat. 3073. FISMA 2002's amendments to title 44, U.S. Code, were largely superseded by the enactment of FISMA 2014.

[6]Pub. L. No 107–347, 116 Stat. 2899.

[7]OMB, *Management and Oversight of Federal Information Technology*, Memorandum M-15-14 (Washington, D.C.: June 10, 2015).

- the provisions commonly referred to as the Federal Information Technology Acquisition Reform Act.[8]

In addition, we reviewed prior GAO reports related to the roles and responsibilities of CIOs in the federal and private sectors,[9] and performed a search of other related literature, including studies, journals, research papers, news articles, and whitepapers. We also met with staff from OMB and the Federal CIO to discuss the role of federal agency CIOs and the Federal CIO.

Based on our review of this information, we identified 14 IT management areas and 35 related responsibilities that are critical to federal agency CIOs for effectively managing IT in their agencies. We found all 14 of the IT management areas were applicable to CIOs in the private sector and should be included within our study. We also found that 13 related responsibilities were applicable. See table 11 for summary of each of these responsibilities.

Table 11: Summary of Responsibilities In Each of the 14 Agency Chief Information Officer (CIO) IT Management Areas

Management area and related responsibilities	Source
IT leadership and accountability – *CIOs are responsible and accountable for the effective implementation of IT management responsibilities.*	Paperwork Reduction Act of 1995[a], Clinger-Cohen Act of 1996, Federal Information Security Modernization Act of 2014, Federal Information Technology Acquisition Reform Act, Office of Management and Budget (OMB) M-15-14, OMB Circular A-130, and *Executive Order 13833, Enhancing the Effectiveness of Agency Chief Information Officers*[b]
Report directly to the agency head or that official's deputy.	Paperwork Reduction Act of 1995[a], OMB M-15-14, and *Executive Order 13833, Enhancing the Effectiveness of Agency Chief Information Officers*

[8]Federal Information Technology Acquisition Reform provisions of the Carl Levin and Howard P. 'Buck' McKeon National Defense Authorization Act for Fiscal Year 2015, Pub. L. No. 113-291, §§ 831-37, 128 Stat. 3292, 3438-3450 (2014).

[9]In particular, we analyzed CIO responsibilities in the following four reports: GAO, *Federal Chief Information Officers: Critical Actions Needed to Address Shortcomings and Challenges in Implementing Responsibilities*, GAO-18-93 (Washington, D.C.: August. 2, 2018); *Federal Chief Information Officers: Opportunities Exist to Improve Role in Information Technology Management*, GAO-11-634 (Washington, D.C.: Sept. 15, 2011); *Chief Information Officers: Responsibilities and Information and Technology Governance at Leading Private-Sector Companies*, GAO-05-986 (Washington, D.C.: Sept. 9, 2005); and *Federal Chief Information Officers: Responsibilities, Reporting Relationships, Tenure, and Challenges*, GAO-04-823 (Washington, D.C.: Jul. 21, 2004).

Management area and related responsibilities	Source
Approve the selection of bureau CIOs.	Federal Information Technology Acquisition Reform Act, OMB A-130, and OMB M-15-14
Designate a senior agency information security officer.	Federal Information Security Modernization Act of 2014
Assume responsibility and accountability for IT investments.	Paperwork Reduction Act of 1995[a] and Clinger-Cohen Act of 1996
IT strategic planning – *CIOs are responsible for strategic planning for all IT management functions.*	Clinger-Cohen Act of 1996[b]
Establish goals for improving agency operations through IT.	Clinger-Cohen Act of 1996
Measure how well IT supports agency programs.	Clinger-Cohen Act of 1996
IT workforce – *CIOs are responsible for assessing agency IT workforce needs and developing strategies and plans for meeting those needs.*	Clinger-Cohen Act of 1996, OMB A-130, and OMB M-15-14[b]
Assess annually the requirements established for agency personnel regarding IT management knowledge and skills.	Clinger-Cohen Act of 1996, OMB A-130, and OMB M-15-14
Assess annually the extent to which agency personnel meet IT management knowledge and skill requirements.	Clinger-Cohen Act of 1996
Annually develop strategies for hiring and training to rectify any knowledge and skill deficiencies.	Clinger-Cohen Act of 1996
IT budgeting – *CIOs are responsible for the processes for all annual and multi-year IT planning, programming, and budgeting decisions.*	Federal Information Technology Acquisition Reform Act, OMB A-130, and OMB M-15-14
IT capital planning and investment management – *CIOs are responsible for the processes for managing, evaluating, and assessing how well the agency is managing its IT resources.*	Clinger-Cohen Act of 1996, Federal Information Technology Acquisition Reform Act, OMB A-130, and OMB M-15-14[b]
Advise the head of the agency on whether to continue, modify, or terminate any acquisition, investment, or activity that includes a significant IT component based on the CIO's evaluation.	Clinger-Cohen Act of 1996 and OMB M-15-14
Review and approve IT contracts, acquisition plans, or strategies.	Federal Information Technology Acquisition Reform Act, OMB A-130, and OMB M-15-14
Information security – *CIOs are responsible for establishing, implementing, and ensuring compliance with an agency-wide information security program.*	Federal Information Security Modernization Act of 2014[b]
Ensure that senior agency officials, including CIOs of bureaus or equivalent officials, carry out their information security responsibilities.	Federal Information Security Modernization Act of 2014
Ensure that agency personnel, including those with significant responsibility for information security, are trained to effectively carry out information security policies, procedures, and control techniques.	Federal Information Security Modernization Act of 2014
E-commerce/E-business – *CIOs are to promote the use of IT by the agency to improve the productivity, efficiency, and effectiveness of agency programs.*	Paperwork Reduction Act of 1995[a]
Enterprise architecture – *CIOs are responsible for developing, maintaining, and facilitating the implementation of a sound, secure, and integrated IT architecture for the executive agency.*	Clinger-Cohen Act of 1996 and Intelligence Reform and Terrorism Prevention Act of 2004
Systems acquisition, development, and integration – *CIOs are responsible for maximizing the value, and assessing and managing the risks, of major information systems initiatives.*	Paperwork Reduction Act of 1995[a] and Clinger-Cohen Act of 1996

Management area and related responsibilities	Source
Information collection – *CIOs are responsible for the review of agency information collection proposals to evaluate the need for and burden of collected information.*	Paperwork Reduction Act of 1995[a]
Records management – *CIOs are responsible for ensuring that the agency implements and enforces records management policies and procedures under the Federal Records Act.*	Paperwork Reduction Act of 1995[a]
Information dissemination and disclosure – *CIOs are responsible for ensuring that the agency's information dissemination activities meet policy goals such as timely and equitable public access to information and for information access under the Freedom of Information Act.*	Paperwork Reduction Act of 1995[a]
Privacy – *CIOs are responsible for compliance with the Privacy Act and related laws.*	Paperwork Reduction Act of 1995[a] and Clinger-Cohen Act of 1996
Statistical policy – *CIOs are responsible for the agency's statistical policy and coordination functions, including ensuring the relevance, accuracy, and timeliness of information collected or created for statistical purposes.*	Paperwork Reduction Act of 1995[a]

Legend: Grey shade = primary IT management area, white shade = related responsibility area.

Source: GAO analysis of federal legislation and guidance. | GAO-22-104603

[a]The Clinger-Cohen Act of 1996 included a provision which assigned many existing agency information resource management activities introduced in the Paperwork Reduction Act of 1995, to the agency CIO. See 44 U.S.C. 3506(a)(2)(A).

[b]Source listed for IT management areas with related responsibility areas are a summary of those for the related responsibilities listed.

We also coordinated with our Office of General Counsel to create a list of 21 key IT management responsibilities assigned in law to the OMB Administrator for Electronic Government and Information Technology, and currently assigned to the Federal CIO. We determined that 14 additional elements of the E-Government Act of 2002 beyond these 21 were also relevant to the Federal CIO, for a total of 35 responsibilities. See table 12 for a list of these 35 responsibilities.

Table 12: Summary and Source of Responsibilities Given to the Administrator of the Office of E-Government and Information Technology

Responsibility	Source
Establish and promote a government-wide program aimed at encouraging contractor innovation and excellence in facilitating the development and enhancement of electronic government services and processes.	E-Government Act of 2002
Assist the General Services Administration in administering the E-Government Fund, to enable the federal government to expand its ability, through the development and implementation of innovative uses of the internet or other electronic methods, to conduct activities electronically.	
Along with the Administrator of the Office of Information and Regulatory Affairs and with other offices within the Office of Management and Budget, the Federal CIO should oversee the implementation of the E-Government Act of 2002, and other relevant statutes.	
Advise the Director of the Office of Management and Budget on the resources required to develop and effectively administer electronic government initiatives.	

Responsibility	Source
Recommend to the Director changes relating to government-wide strategies and priorities for electronic government.	
Provide overall leadership and direction to the executive branch on electronic government.	
Promote innovative uses of IT by agencies, particularly initiatives involving multi-agency collaboration, through support of pilot projects, research, experimentation, and the use of innovative technologies.	
Oversee the distribution of funds from, and ensure appropriate administration and coordination of, the E-Government Fund.	
Coordinate with the Administrator of General Services regarding programs undertaken by the General Services Administration to promote electronic government and the efficient use of IT by agencies.	
Lead the activities of the Chief Information Officers Council established in the E-Government Act of 2002 on behalf of the Deputy Director for Management, who shall chair the council.	
Assist the Director in establishing policies which shall set the framework for IT standards for the federal government developed by the National Institute of Standards and Technology and promulgated by the Secretary of Commerce.	
Sponsor a dialogue between federal, state, local, and tribal leaders on electronic government to encourage collaboration, improve the use of IT, and enhance the understanding of best practices and innovative uses of IT.	
Sponsor activities to engage the general public in the development and implementation of policies and programs, particularly activities aimed at fulfilling the goal of using the most effective citizen-centered strategies and those activities which engage multiple agencies providing similar or related information and services.	
Oversee the work of the General Services Administration and other agencies in developing the integrated internet-based system under section 204 of the E-Government Act of 2002.	E-Government Act of 2002
Work with the Administrator for Federal Procurement Policy to ensure effective implementation of electronic procurement initiatives.	
Assist federal agencies in implementing accessibility standards under the Rehabilitation Act of 1973.	
Oversee the development of enterprise architectures within and across agencies.	
Assist in overseeing agency efforts to ensure that electronic government activities incorporate adequate, risk-based, and cost-effective security compatible with business processes.	
Administer the Office of Electronic Government established under the E-Government Act of 2002.	
Assist the Director in preparing an E-Government report as established in the E-Government Act of 2002.	
Assist in setting the strategic direction for implementing electronic government laws and initiatives, and assists the Director in carrying out those laws and initiatives.	
Along with the CIO Council, identify, develop, and coordinate multi-agency projects and other innovative initiatives to improve government performance through the use of IT.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to capital planning and investment control for IT.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to the development of enterprise architectures.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to information security.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to privacy.	

Responsibility	Source
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to access to, dissemination of, and preservation of government information.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to accessibility of IT.	
Work with other offices within the Office of Management and Budget to oversee implementation of electronic government relating to other areas of IT.	
Consult the with agency CIO and program manager of certain major IT investment projects that receive a high risk rating when they conduct a review to identify the reasons for the high level of risk of the investment, the extent to which the causes can be addressed, and the probability of future success. The Federal CIO also then communicates the results of those reviews to certain Congressional committees.	Federal Information Technology Acquisition Reform Act
Hold membership on the Program Management Policy Council.	Program Management Improvement Accountability Act
Hold membership on the Presidential Innovation Fellows Program advisory board.	Tested Ability to Leverage Exceptional National Talent Act of 2017
Chair the Technology Modernization Board.	Modernizing Government Technology Act of 2017
Hold membership on the Chief Data Officer Council.	Foundations for Evidence-Based Policymaking Act of 2018
Issue guidance jointly with the Administrator of the Office of Information and Regulatory Affairs for agencies to develop and maintain comprehensive data inventories (authority delegated from the Director).	

Source: GAO analysis of federal laws and guidance. | GAO-22-104603

Step 2: Selecting private sector companies to use in survey

In order to better ensure that we surveyed private sector CIOs with responsibilities comparable to federal agency CIOs, we took steps to choose private sector companies comparable to federal agencies. We collected data from Leadership Connect's "Top 1,000" companies database.[10] Among other things, we identified domestic locations, revenue, and number of employees for each company from Leadership Connect. We reviewed data on the 1,000 companies and removed 19 subsidiary companies from the list, resulting in a population of 981

[10]Leadership Connect tracks leaders in government, business, and media and maintains detailed profiles of them. Specifically, Leadership Connect's database on companies covers U.S. public and private companies with revenues of at least $2 billion and foreign publicly traded companies with revenues of at least $20 billion, as well as the "Big 4" accounting firms and major consulting firms.

companies. In order to select companies that had similar characteristics to federal agencies, we researched the number of employees and annual budget of the 24 federal agencies covered by the Chief Financial Officers Act of 1990. We found that those 24 agencies had number of employees ranging from 1,504 to 740,129, and fiscal year 2021 annual budgets ranging from $739 million to $705 billion. Of the 981 companies, we found 922 companies with employees and revenue that fell within the ranges of the federal agencies.

Of the 922, we randomly selected 600 companies to survey. For each, we attempted to identify the companies' CIOs, or positions with equivalent responsibility to the CIO, such as Chief Technology Officer or Executive Vice President. We were able to identify CIO or equivalent contact information for 488 of the 600 companies. We then collected each contact's name, official title(s), employment start date, education, career history, email, phone, and location. In instances where Leadership Connect did not have these data, we performed additional searches of library resources, the companies' websites, and a social network for professionals.

Because the selection of the companies for this study was a non-probability sample, the results are not intended to represent all CIOs or companies.[11] To this end, the companies we selected are not representative of all private sector companies, and the CIOs we surveyed are not representative of all of those in the private sector. In addition, the practical difficulties of conducting any survey may introduce non-sampling errors. For example, errors can be introduced into the results due to differences in how a particular question is interpreted, the sources of information available to respondents, or the types of people who do not respond to a question. We included steps in both the data collection and data analysis stages to minimize such non-sampling errors.

Step 3: Creating, pretesting, and administering the survey

We developed questions for the survey based on the list of relevant federal agency CIO responsibilities. To address federal agency CIO

[11]Results from non-probability samples cannot be used to make inferences about a population, because in a non-probability sample some elements of the population being studied have no chance or an unknown chance of being selected as part of the sample.

responsibilities, we included questions related to each of the 14 IT management areas in which federal agencies have responsibilities. We also included nine questions on whether the CIOs have any responsibilities outside of those within the 14 IT management areas for federal CIOs. For each of the 14 IT management areas of responsibility and those additional areas outside of them, we included questions that requested information on whether each CIO and their staff were responsible and whether it was shared with another person(s) other than their staff. For some areas (e.g., information dissemination and information collection), we provided descriptions of analogous activities that might be found in the private sector.

With regards to the Federal CIO, we analyzed each of the 35 key Federal CIO-specific responsibilities discussed in Step 1 to identify a subset of 16 that were also relevant to private sector CIOs. We compared these 16 responsibilities to the 14 IT management areas (identified in Step 1) to ensure that all 16 would be covered by survey questions on the IT management areas. We also identified five responsibilities that were both unique to the Federal CIO and directly applicable to private sector CIO responsibilities, and created specific survey questions for each of these five.

In addition to questions on CIO responsibilities, we included questions on CIO qualifications, education, experience, and tenures. To further improve the content and format of the survey, we consulted with external subject matter experts on the CIO areas of responsibility and the applicability of these to the private sector, and reviewed the format of a previous GAO survey on CIO responsibilities. A survey specialist helped design the survey and another internal survey specialist independently reviewed the survey's content for methodological appropriateness. To ensure relevancy to private sector CIOs when we surveyed them, we analyzed and modified the language describing federal and agency CIO management areas and associated responsibilities to generally match those of a private sector company. For example, we replaced 'agency' with 'company' and 'bureau' with 'subsidiary company'.

We conducted four survey pretests with private sector CIOs to help further refine our questions, develop new questions, and clarify any ambiguous questions. We then revised the survey, as necessary, to reduce the likelihood of overall and item non-response, as well as any reporting errors on our questions.

On November 9, 2021, we administered the web survey to the 488 identified CIOs, or an equivalent official performing CIO duties, such as Chief Technology Officer or Vice President of Information Systems. To improve the response rate, we sent three email reminders and followed up with phone calls. We ended survey collection on December 22, 2021.

Of 488 surveys sent, we obtained fully completed responses from 71 CIO or CIO equivalents, for a nearly 15 percent response rate. The final survey sent to participants is replicated in appendix I, along with a summary of responses. Appendix II includes a list of CIOs who participated in our survey. Survey data of the survey responses were electronically extracted by our survey specialist. We examined the survey results and performed computer analyses to identify missing data, inconsistencies, and other indications of error, and corrected any that we found. For example, GAO staff and an independent GAO analyst performed quantitative data analyses and a review of open ended responses and checked the data for accuracy.

Step 4: Conducting expert panels

To supplement our survey responses, and to obtain additional narrative and supporting context for our reporting objectives, we held two panels: one with nine CIOs and another with 10. Each of the two panels had both private sector CIO participants and former federal CIO participants. The purpose of this discussion was to gain clarifications needed on our survey data and preliminary observations of the overlap of responsibilities of the private sector and federal agency CIOs. In addition, both panels addressed their experiences with tenure, qualifications, reporting relationships, and challenges. Appendix II lists the panelists of both panels.

After holding the panels, we identified common themes from them. Among two analysts, the first analyst summarized the main discussion points and consolidated the groupings into an index of categories for each major topic area. For instance, analysts created an index of topics related to CIO reporting relationships and CIO challenges. A second analyst then reviewed the first analyst's coding, and the two analysts met and resolved any areas of disagreement.

For our first objective, we analyzed and reported on survey responses (collected in Steps 1-3) related to

- whether or not private sector CIOs had responsibility over the 14 IT management areas,[12] as well as 13 component responsibilities within five of these management areas, that pertain to federal agency CIO responsibilities in laws and guidance;[13]
- the extent to which private sector CIOs had and/or shared responsibility in each of the management areas represented in the survey; and
- whether or not private sector CIOs had responsibility for eight responsibility areas that, based on our research, were relevant to CIOs, but were beyond the purview of federal agency CIOs in laws and guidance.

We further analyzed the survey responses we received to determine their consistency with results from our expert panel. We also analyzed survey findings on the direct reporting relationships of CIOs, as well as the relationship between the executives that respondents reported to and the degree to which respondents had responsibility over all technology decisions at their company.

For the second objective, we reported on and analyzed survey responses on CIO education levels, qualifications, prior CIO experience, and tenure. We also analyzed the relationship between respondents' education level, years of prior CIO experience, tenure, and the degree to which respondents had responsibility over all technology decisions at their company. Similar to our first objective, we further analyzed the survey responses we received to determine their consistency with results from our expert panel.

For the third objective, we compared responsibilities currently assigned to the Federal CIO and to federal agency CIOs to determine the extent to which Federal CIO responsibilities covered each of the 14 IT management areas. We analyzed whether the level of specificity of Federal CIO responsibilities differed from those of federal agency CIOs within some IT management areas. We also analyzed and reported on survey responses related to responsibilities shared by the government-

[12]In order to gain further clarity in responses, we split the IT systems acquisition, development, and integration management area into three questions, one each for acquisition, development, and integration, in the survey; however, for the purposes of the report, we consolidated the responses back into one management area.

[13]We did not survey federal agency CIOs to determine the extent to which they perform these activities.

wide Federal CIO and private sector CIOs to determine the extent to which private sector respondents had responsibility over specific areas currently assigned to the Federal CIO, or in areas beyond those currently assigned to the Federal CIO.

For the fourth objective, we analyzed statements made by private sector and former federal agency CIOs in our expert panel to determine issue areas seen by panelists both (1) as being handled differently by private sector companies versus federal agencies, and (2) as challenges to federal agency CIOs. For each of two such issue areas, we compared expert panelists' consensus of federal actions against relevant best practices defined in prior GAO products. For context, we added related information from our survey respondents and laws and guidance.

Regarding the issue area of managerial skills in CIO hiring, we determined that the control environment component of internal control was significant to this objective, along with the underlying principle that management should demonstrate a commitment to recruit, develop, and retain competent individuals. Two analysts independently analyzed responses by private sector and former federal agency CIOs in each of the two expert panels to determine that panelists commonly identified this issue area as a challenge for federal agencies. We determined that handling of this issue area diverged between the private sector and federal agencies by determining that a majority of private sector CIO survey respondents reported having key non-technical skills. We also interviewed the Federal CIO to determine whether OMB currently considers greater consideration of non-technical skills in agency CIO hiring a key concern.

We conducted this performance audit from October 2020 to September 2022 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contacts listed above, the following staff made significant contributions to this report: Jessica Steele (Assistant Director), Shaun Byrnes (Analyst in Charge), Ashfaq Huda (Analyst in Charge), Andrew Avery, Sharhonda Deloach, Rebecca Eyler, Patrick Harner, Michael Silver, Whitney Starr, and Andrew Stavisky.

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