

A NEW ENGINE

Driving Innovation in State Technology



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About the National Association of State Chief Information Officers

Founded in 1969, the National Association of State Chief Information Officers (NASCIO) represents state chief information officers (CIOs) and information technology (IT) executives and managers from the states, territories and District of Columbia. NASCIO's mission is to foster government excellence through quality business practices, information management and technology policy. NASCIO provides state CIOs and state members with products and services designed to support the challenging role of the state CIO, stimulate the exchange of information and promote the adoption of IT best practices and innovations. From national conferences to peer networking, research and publications, briefings and government affairs, NASCIO is the premier network and resource for state CIOs. For more information, visit www.NASCIO.org.

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Executive Summary

The role of the state CIO is being transformed by challenges to traditional business models, by emerging technologies that have the potential to redefine what we consider as "IT", and by the drive to implement digital government.

We asked state CIOs to share their perspective on a number of topics, with a particular focus on the continued evolution of the CIO as a broker of shared services, on the emergence of new and disruptive technologies, and on strategies being used to embrace digital government. These topics all involve CIOs adapting to a changing technology and customer landscape, and reimagining the role and purpose of the state CIO organization.

Business Models

The role of a CIO and which business models support that role vary widely across state governments. Since first asking about these topics in 2010, responses have shown a consistent trend of moving towards CIOs operating as a business manager or broker of services as opposed to an owner and operator of assets. More and more states are using shared services models for their IT operations.

When asked how CIO organizations plan to deliver or obtain IT services over the next three years, responses support the idea that CIOs are continuing to shift the business model in order to implement more shared services, managed services, and outsourcing operations. The trends are to a point that we can safely say that the dominant business model across state government is one of a CIO organization operating as a shared services broker that leverages managed services and outsourcing to deliver on their service portfolio.

Given the constant trend towards CIOs acting as brokers for IT services, we introduced a question that sought to understand the obstacles that organizations encounter when making this move. Concerns over funding models and ability to deliver on specialized needs trouble close to half of CIOs. Funding models and a CIO's ability to recover costs vs. operate under a general appropriation are currently catching up to the idea that CIOs are operating as brokers in a managed services model. Some states struggle with a mechanism to recover costs and balance that model with appropriations for enterprise-wide services like cybersecurity.

Digital Government

Driven by experiences in the marketplace, digital government has taken on a broader definition than simply moving state government to online services. State leaders aspire to have seamless citizen transactions, increase engagements, provide mobile services, establish common online identities, and enable crowdsourcing and digital assistants to help navigate services. Digital government is an enterprise priority for all state CIOs and this is reflected as a pillar in strategic IT plans across the states. As to be expected, the state CIO plays a significant role in administering statewide digital government services. Only seven percent of respondents said that the CIO had no role. At least two-thirds of respondents said that the CIO is responsible for setting overall direction, execution and/or oversight of administering statewide digital government services. An overwhelming 78 percent said the CIO is responsible for leading or participating in policy setting when it comes to digital services.

Executive Summary Continued

When we asked state CIOs about their approach to delivering digital government services 40 percent said that they already have a digital services organization, while 20 percent plan to create a digital services organization and 22 percent said it was the responsibility of the agencies or departments. Only 17 percent said the approach was ad-hoc / not defined. Moving toward a common delivery framework with a digital services organization is another positive sign of advancing maturity. One state went as far as renaming the enterprise CIO organization the "Agency of Digital Services" to emphasize the importance. Another dedicated a Deputy CIO position to look at user experience and a unified branding for the state.

When it comes to execution, individual survey comments on each state's approach to delivering digital government services varied between using an outside vendor, having a centralized approach (or moving in that direction) or having a decentralized approach. State CIOs felt that the most significant barriers to effectively delivering digital government services were agency readiness, budget, security/identity management and cross-boundary collaboration.

Emerging IT

Based on data from recent surveys and inquiries from states, NASCIO and the industry have recently focused significant attention on the emerging technology landscape. CIOs were asked to describe their state's status and progress related to the management of emerging networked state devices. As in prior years, the majority of CIOs said it was ad-hoc or in the discussion phase, but the percentage of states that have created

a roadmap has increased, as has the percentage that stated that emerging networked devices are reflected in their strategic plan. State CIOs are particularly concerned about the security risks of these devices on state networks. Some CIOs commented that some agencies were further along than others and that they are still focusing on developing a security policy for these devices. Although not dramatic, we're seeing growing recognition of the need for CIOs to address emerging technologies by design rather than default.

Looking toward the near future, we asked CIOs what emerging IT area will be most impactful in the next 3-5 years. The Internet of Things and artificial intelligence / machine learning garnered the majority of responses. Digital assistants and blockchain each received a fewer number of responses, and despite a constant barrage of media attention focused on connected/autonomous vehicles, that technology only received one vote.

The role of the state CIO in evaluating and implementing these emerging technologies is clearly still being defined. Given the diversity of technologies under consideration – from autonomous vehicles to police body cameras – even the definition of what constitutes "IT" is not always clear. Not all technology comes through the state IT organization, and the role of the state CIO in governance and risk management is still to be determined. As one CIO put it, "It's not my job to push emerging tech; my job is to listen and push them to justify the business need. If they can justify the business need, the job of IT is to help them think it through. We have an advisory and consultative role to bring people together."

About the survey

Survey purpose

The National Association of State Chief Information Officers (NASCIO), Grant Thornton LLP and CompTIA have collaborated for an eighth consecutive year to survey state government IT leaders on current issues, trends and perspectives. The survey sponsors seek to provide these state government IT leaders with an opportunity to voice their thoughts and opinions on matters of high importance. Governors, legislators and business leaders can benefit from these knowledgeable insights about essential state IT services.

Methodology

In spring 2017, the sponsors jointly developed a series of questions reflecting both the new issues of the day as well as follow-up on some of the questions they included in prior years' surveys. The questions were presented to state CIOs in an online tool, and between June and July 2017, they individually logged in and addressed the forty multiple-choice and open-ended questions.

Forty-two of the NASCIO member states and territories completed the survey. Primary respondents were the state CIOs, although deputy CIOs and other senior state IT leaders contributed. Throughout the survey, we refer to them all as state CIOs. Twenty-nine of the respondents also participated in the 2016 survey. However, new perspectives were introduced by 26 percent of the respondents who are different due to the normal turnover that occurs in state CIO positions. We also conducted in-person interviews with eighteen state CIOs and incorporated their "advice from the trenches" along with the quantitative and qualitative responses to the online survey.

Anonymity

This report reflects the responses and opinions of the survey respondents to the maximum extent possible. However, to preserve anonymity we do not attribute responses to specific individuals.

To obtain a copy of the survey report or questionnaire, please see the inside back cover of this report for directions to the sponsor organizations' websites.

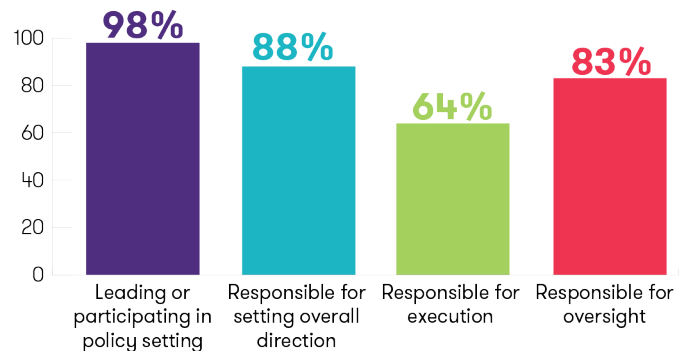
Cybersecurity

Security and Risk Management is the number one priority of State CIOs according to the *State CIO Top Ten Policy and Technology Priorities for 2017* published by NASCIO. As we have done since 2013, we asked CIOs about the current status of their cybersecurity program. When compared to the responses from 2015 and 2013, it is clear that significant progress continues to be made. In particular, formal adoption of a cybersecurity strategic plan and framework is significantly more widespread than it was four years ago. This is a positive development toward risk reduction. In addition, CIOs report greater success in creating a culture of information security and in establishing trusted partnerships for information sharing and response. While the percentage of respondents whose states have obtained cyber insurance remains at only 38 percent, this is an increase of 18 percent from just two years ago.

Characterize the current status of the cybersecurity program and environment in state government.			
	2013	2015	2017
Adopted a cybersecurity framework based on national standards and guidelines	78%	80%	95%
Acquired and implemented continuous vulnerability monitoring capabilities	78%	80%	79%
Developed security awareness training for workers and contractors	78%	87%	88%
Established trusted partnerships for information sharing and response	75%	80%	83%
Created a culture of information security in your state government	73%	74%	83%
Adopted a cybersecurity strategic plan	61%	74%	83%
Documented the effectiveness of your cybersecurity program with metrics and testing	47%	52%	57%
Developed a cybersecurity disruption response plan	45%	52%	69%
Obtained cyber insurance	n/a	20%	38%

We asked CIOs what role they currently have in administering their state's cybersecurity program. Almost all CIOs report their role as leading or participating in policy setting, and over 80 percent are also responsible for setting overall direction and for oversight. In contrast, only 64 percent are directly responsible for execution of the program. With recent legislation and executive orders expanding and strengthening the CIO role in cybersecurity, we expect to see this number increase in future surveys.

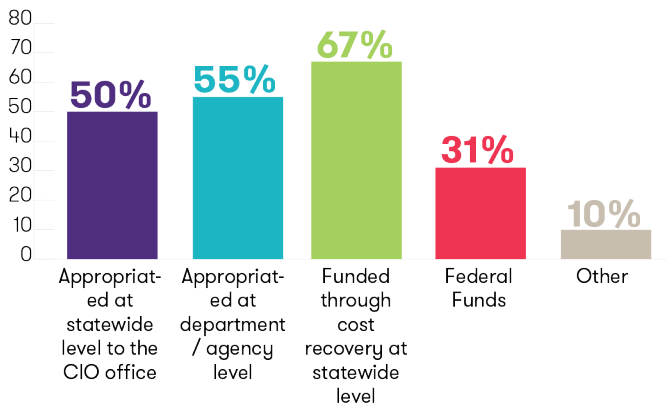
What is the current role of your CIO organization in administering the statewide cybersecurity program?



When asked what their desired role would be, most CIOs felt that their current role was appropriately defined. However, a number of CIOs felt they should have a greater role in setting direction and in oversight.

Funding (or rather lack of funding) is frequently reported by CIOs as being a significant barrier to achieving cybersecurity goals. As one CIO stated, "IT is the bottom feeder of the agency budget and security is the bottom feeder of the IT budget". We asked CIOs how their states funded cybersecurity efforts. A wide variety of mechanisms are used, with 50 percent of CIOs reporting funds appropriated at a statewide level to the CIO's office, and 55 percent reporting funds appropriated at a department level. Cost recovery however remains the most frequently cited funding source.

How is cybersecurity currently funded for your state?

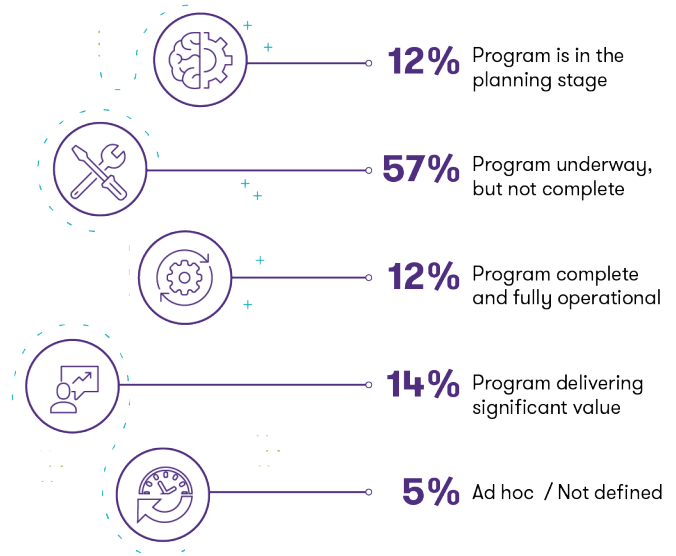


The use of data analytics to support cybersecurity efforts has become both more widespread and more sophisticated in recent years. We asked CIOs how their states are using analytics tools to manage their cybersecurity program aligned with the functions of the National Institute of Science and Technology (NIST) Cybersecurity Framework. Use of tools to support identification and protection of assets, and to assist in detection of threats is very commonplace. Tools to support response and recovery are not yet as widely used.

How are analytical tools being used to manage the cybersecurity program?	
Identification – supports understanding of systems, assets, data, and capabilities that require cybersecurity	88%
Protection – support safeguards to ensure delivery of critical infrastructure services	91%
Detection – support identification of the occurrence of a cybersecurity event	95%
Response – support actions taken regarding a detected event	76%
Recovery – support activities to maintain plans for resilience and to restore capabilities/services that were impaired due to an event	57%

Almost all CIOs reported the existence of a metrics program in their state to collect, analyze and report data on security processes, performance and outcomes. Approximately a quarter of states have a fully operational program, while almost 70 percent of states are in the process of planning or establishing such a program. Having a fully operational program with documented outcomes is vital to garnering more political support and increased funding.

Characterize the current status of your enterprise cybersecurity metrics program to collect, analyze and report data on security processes, performance and outcomes.



Cloud Services

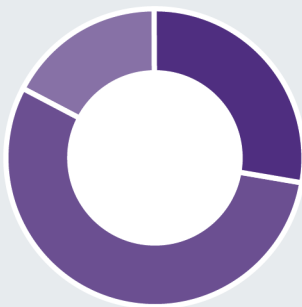
As we have done in the past several surveys, we asked CIOs to tell us what categories of services they have migrated or plan to migrate to the cloud. Email and collaboration services continue to be the most common services migrated, closely followed by office productivity and storage. However, security-related services are now close behind these in popularity, and project and portfolio management solutions are also now more commonly being considered for migration in the cloud.

This year, we asked CIOs how the results of cloud migration efforts have compared to the benefits originally expected of them. In general, CIO's reported actual benefits in close agreement with their initial expectations. The one significant area of difference was in enhanced scalability through more flexible utilization and pay-per-use. While 81 percent of CIOs expected this to be a benefit from migrating services to the cloud, only 65 percent reported actually seeing this occur.

How have the results of migration to cloud-enabled solutions compared to expectations?		
Benefit	Percentage of states expecting to observe benefit	Percentage of states actually observing benefit
Lowered asset investment threshold / improved ability to innovate (<i>Adaptability</i>)	78%	75%
Enhanced utilization/pay-per-use (<i>Scalability</i>)	81%	65%
Cost savings	44%	38%
Reduced risk exposure (<i>Service Stability, Recoverability</i>)	61%	63%
Improved compliance, reporting (<i>Accuracy</i>)	29%	23%

When asked if their state had a strategy to migrate legacy applications to the cloud, over 80 percent responded that such a strategy was either complete or in process.

Does your organization have a strategy to migrate legacy applications to the cloud?



28% Yes, cloud migration strategy in place

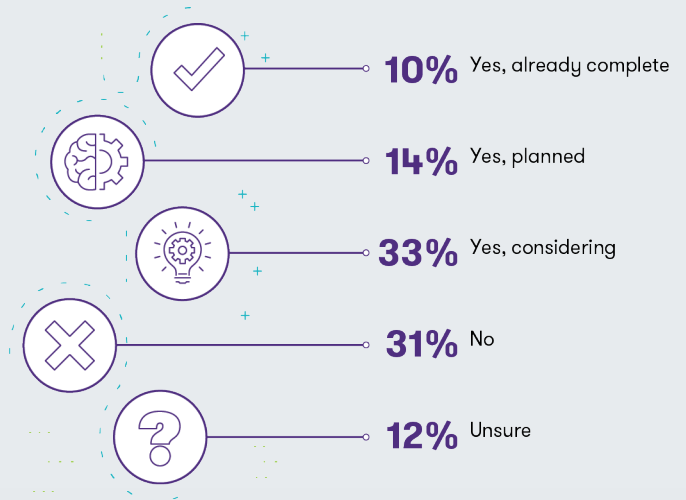
55% No, but cloud migration strategy in development

17% No cloud migration strategy planned

Provision of mainframe computing services to state agency customers has long been a staple of the state CIO function, and it is still a service provided by a large majority of state CIO organizations. Operating under a charge-back model to agency customers, mainframe services have historically been a major revenue source for state CIOs. However, as state CIO organizations migrate towards a service broker model and the demand for mainframe cycles decline, all CIO services are being re-assessed. Off-premise Mainframe-as-a-Service solutions have been available for several years. We asked CIOs whether they

were planning to move to such a solution in the next 2-3 years. Perhaps surprisingly, over 50 percent of CIOs responded that they had either completed such a move or were considering it.

Are you planning to move to an off-premise Mainframe-as-a-Service solution in the next 2-3 years?



Agile and Incremental Software Delivery

Use of Agile and incremental software delivery approaches continue to progress in state governments. When we asked CIOs two years ago about their use of these approaches, most CIOs reported limited use, or pilots occurring on certain projects. Two years later, over a third of CIOs report widespread use of Agile, with only 19 percent reporting no or limited uses. The states in the pilot/trial stage remained relatively flat from 2015 through 2017. It's possible these states are taking a more careful approach to Agile adoption that will result in a well-defined operating discipline with appropriate integration in the near future. The only area that has not significantly changed is the degree to which states have implemented centralized oversight of Agile adoption. This has remained at around ten percent. Based on these responses, it appears Agile is more of a grassroots effort at the agency level with encouragement by the state CIO organization.

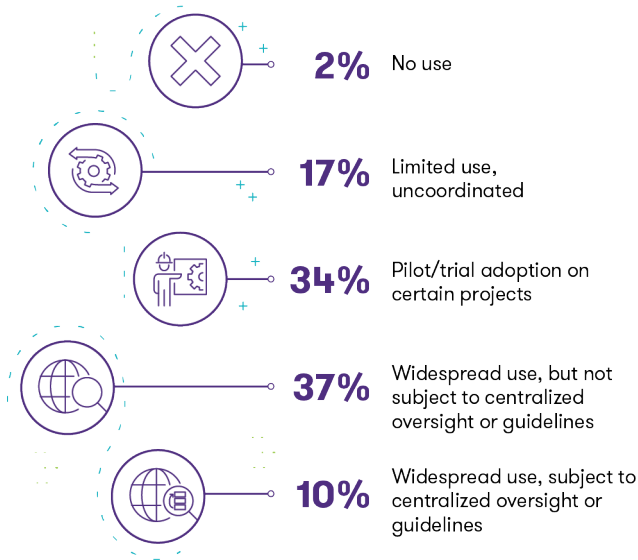
Last year we also asked CIOs about the adoption of DevOps within their states. DevOps is a culture and practice that emphasizes automating the process of software delivery and infrastructure changes. It aims at establishing a culture and environment where building, testing, and releasing software can happen rapidly, frequently, and more reliably. Organizations with significant experience using Agile often view DevOps as a key contributor to the successful adoption of the Agile approach, and as a next step to becoming an "Agile Enterprise." We asked CIOs whether their state has implemented the practice of DevOps to support the entire service lifecycle and changes over one year have been quite dramatic. While 42 percent of CIOs stated last year that they either were not employing DevOps or did not know, only 15 percent made that response this year. In contrast, 42 percent of states are now adopting DevOps on a limited basis, and 37 percent of states have pilots or trials underway. DevOps adoption appears to be following a similar trajectory to general adoption of Agile, but trailing it by a couple of years.

How would you characterize the use of Agile or incremental software development approaches within your state?		
	2015 Response	2017 Response
No use / does not apply	4%	2%
Limited use, uncoordinated	34%	17%
Pilot/trial adoption on certain projects	32%	34%
Widespread use, but not subject to centralized oversight or guidelines	21%	37%
Widespread use, subject to centralized oversight or guidelines	9%	10%

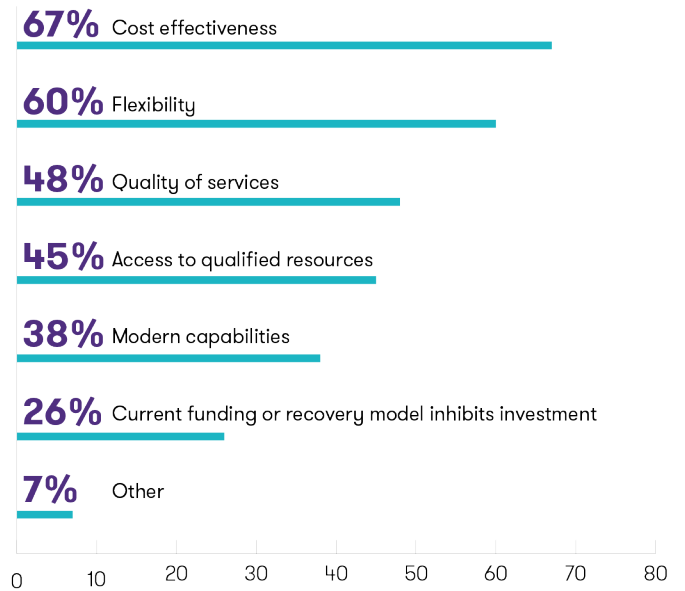
As an outgrowth of Agile, has your state implemented the practice of DevOps to support the entire service lifecycle?		
	2016 Response	2017 Response
No use / does not apply	42%	15%
Limited use, uncoordinated	29%	42%
Pilot/trial adoption on certain projects	24%	37%
Widespread use, but not subject to centralized oversight or guidelines	2%	5%
Widespread use, subject to centralized oversight or guidelines	5%	2%

We also asked CIOs for their predictions on how the use of Agile approaches would develop in the next several years in their state. Only 15 percent of CIOs felt that Agile would have a niche role, while almost half believed Agile and traditional waterfall approaches would coexist and be used roughly equally. Over a third of CIOs felt the move to Agile would mostly displace traditional waterfall approaches.

How would you characterize the use of Agile or incremental software development approaches within your State?



What are the top three strategic or operational issues that are driving the increase in the use of brokered services?



We asked CIOs in 2015 how well they felt their state's procurement and contracting policies and processes supported the use of Agile and incremental software development approaches. We asked the question again this year, and the responses were almost unchanged. Approximately one fifth of CIOs felt they did not support them at all, another one fifth felt they supported them fully, and the rest of the respondents reported partial support. It appears that changes in procurement policies and processes have not kept pace with the increased adoption of Agile within the states.

Business Models, Sourcing and the CIO as Broker

The role of a CIO and which business models support that role vary widely across state governments. Since first asking about these topics in 2010, responses have shown a consistent trend of moving towards CIOs operating as a business manager or broker of services as opposed to an owner and operator of assets. More and more states are using shared services models for their IT operations.

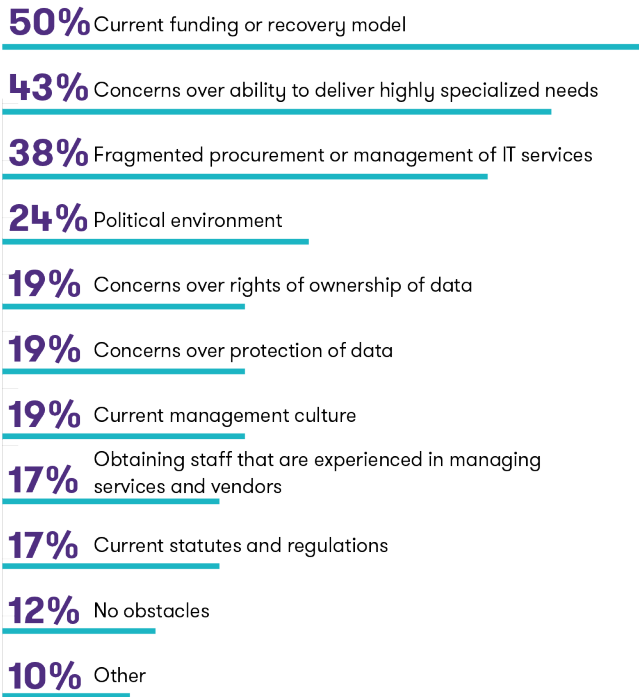
When asked how CIO organizations plan to deliver or obtain IT services over the next three years, responses support the idea that CIOs are continuing to shift the business model in order to implement more shared services, managed services and outsourcing operations.

States are continuing to examine how a CIO should operate, and the general consensus is that more than half of the states are downsizing state owned and operated data centers and expanding outsourcing. The trends show that the dominant business model across state government is one of a CIO organization operating as a shared services broker that leverages managed services and outsourcing to deliver on their service portfolio.

How does your state CIO organization plan to deliver or obtain IT services over the next three years?			
	2015	2016	2017
Introduce an IT shared services model	6%	13%	19%
Expand existing IT shared services model	62%	72%	60%
Downsize or scale back existing IT shared services model	0%	2%	5%
Introduce a managed services model	26%	17%	21%
Expand existing managed services model	53%	61%	55%
Downsize or scale back existing managed services model	2%	2%	5%
Introduce outsourcing as a new service model	15%	17%	33%
Expand outsourcing	43%	45%	45%
In-source some operations that are currently outsourced	17%	19%	17%
Downsize or scale back outsourced operations	0%	8%	2%
Outsource business applications through a SaaS model	55%	66%	52%
Downsize state-owned-and-operated data center(s)	59%	28%	55%

Given the constant trend towards CIOs acting as brokers for IT services, we introduced a question that sought to understand the obstacles that organizations encounter when making this move. Concerns over funding models and ability to deliver on specialized needs trouble close to half of CIOs. Funding models and a CIOs ability to recover costs vs. operate under a general appropriation are currently catching up to the idea that CIOs are operating as brokers in a managed services model. Some states struggle with a mechanism to recover costs and balance that model with appropriations for enterprise-wide services like cybersecurity.

What are the top three obstacles for your State CIO organization to acting as a broker for IT services?



The motivation behind driving to a brokered services model is dominated by cost effectiveness (66 percent of responses), flexibility (60 percent), and the quality of services (48 percent) or access to qualified resources (45 percent). These motivations are not surprising, as brokering services reduces or relieves the infrastructure and operational costs on the CIO organizations as well as allowing them access to vendor-supported services and resources that may not exist in government.

What are the top three strategic or operational issues that are driving the increase in the use of brokered services?	
Cost effectiveness	67%
Flexibility	60%
Quality of services	48%
Access to qualified resources	45%
Modern capabilities	38%
Current funding or recovery model inhibits investment	26%

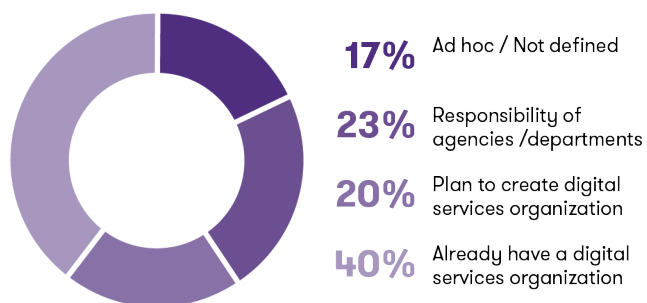
Digital Government

Driven by experiences in the marketplace, digital government has taken on a broader definition than simply moving state government to online services. State leaders aspire to have seamless citizen transactions, increase engagements, provide mobile services, establish common online identities, and enable crowdsourcing and digital assistants to help navigate services. Digital government is an enterprise priority for all state CIOs and this is reflected as a pillar in strategic IT plans across the states. As to be expected, the state CIO plays a significant role in administering statewide digital government services. Only 7 percent of respondents said that the CIO had no role. At least two-thirds of respondents said that the CIO is responsible for setting overall direction, execution and/or oversight of administering statewide digital government services. An overwhelming 78 percent said the CIO is responsible for leading or participating in policy setting when it comes to digital services.

Most respondents indicated that the CIO's office or department has a leadership role with respect to overseeing digital government services even if services are outsourced and/or agencies manage specific services. Many indicated that this was not always the case, but cited legislation, executive orders or consolidation efforts that gave the CIO's office oversight of government digital services at some point over the last two decades. This certainly reflects a growing understanding that an enterprise direction and oversight are vital to meeting the needs of citizens who prefer to deal a "unified face" of state government and not agency silos with fragmented services.

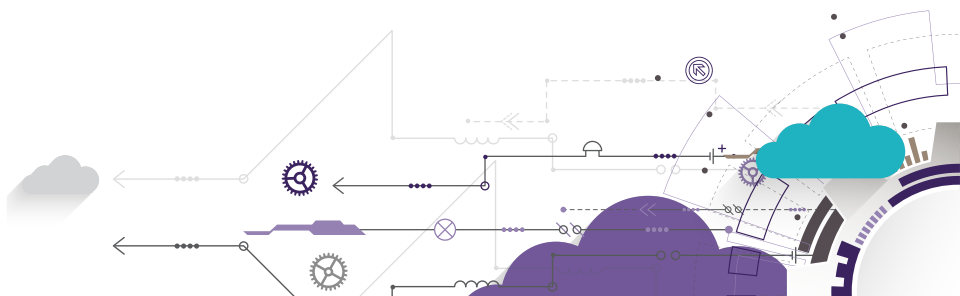
When we asked state CIOs about their approach to delivering digital government services 40 percent said that they already have a digital services organization, while 20 percent plan to create a digital services organization and 23 percent said it was the responsibility of the agencies or departments. Only 17 percent said the approach was ad-hoc / not defined. Moving toward a common delivery framework with a digital services organization is another positive sign of advancing maturity. One state went as far as renaming the enterprise CIO organization the "Agency of Digital Services" to emphasize the importance. Another dedicated a Deputy CIO position to looking at user experience and a unified branding for the state.

What is your approach to delivering digital government services?

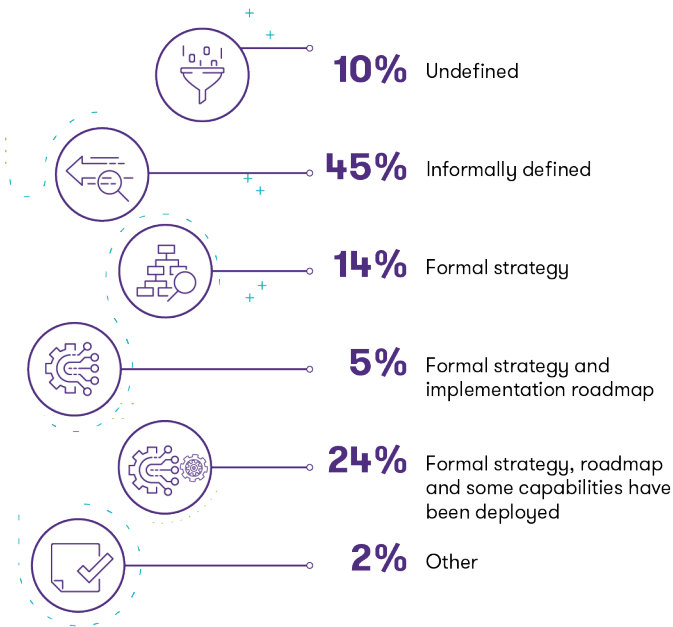


When it comes to execution, individual survey comments on each state's approach to delivering digital government services varied between using an outside vendor, having a centralized approach (or moving in that direction) or having a decentralized approach. A few comments discussed revamping, reorganizing or starting a centralized digital services organization, or the desire to organize into a single organization but finding budget constraints a challenge in doing so.

When asked about the status of delivering digital government services, answers were varied. About a quarter of respondents said that they have a formal strategy and roadmap and have already deployed some capabilities with another five percent reporting that they have the formal strategy and roadmap but have not yet deployed. A larger percentage (45 percent) said that their status is informally defined. A small percentage (ten percent) reported their status as undefined.

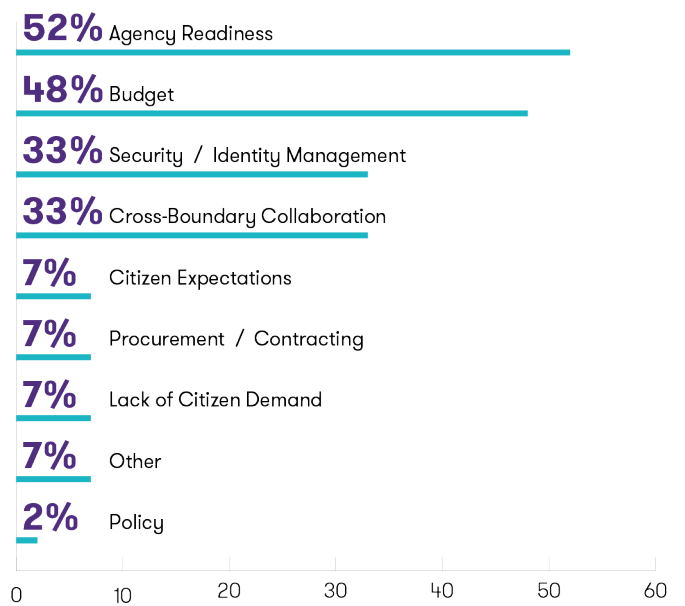


What is the current status of digital government in your state?



State CIOs were asked to select among a series of barriers to effectively delivering digital government services and rank them. The top four challenges reported were agency readiness, budget, security/identity management and cross-boundary collaboration, in that order.

What are the top two challenges in delivering digital government services?



Agency readiness was the top choice with over half of respondents indicating readiness as one of their top two challenges. Readiness has multiple dimensions, so without more evidence from the survey, it's difficult to attribute this top challenge to one explanation. To meet their mission, state agencies must support multiple channels of service delivery and are often hampered by competing budget priorities regarding investments. Without strong and compelling citizen demands to provide a digital option, agencies often find it difficult to invest in a new way of doing business. As one CIO stated, "We really need to have a customer centric view of how to deliver services." In addition, a third of the respondents note that CIOs have struggled to implement enterprise identity services for digital government transactions. However, a few states are investing in pilots or have launched an enterprise citizen-facing platform to provide a single identity solution across state agencies supporting multiple services.

Emerging IT

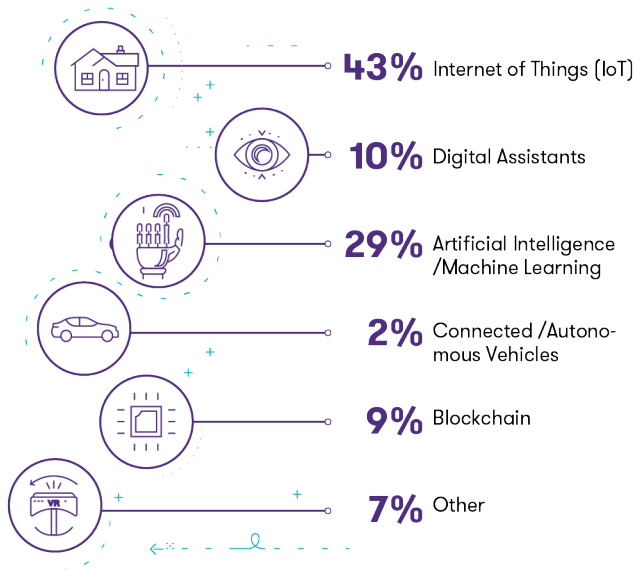
Based on data from recent surveys and inquiries from states, NASCIO and the industry have recently focused significant attention on the emerging technology landscape. For instance, in 2015 and 2016 we asked state CIOs to what extent the Internet of Things (IoT) was on their agenda. We found discussions on IoT to be informal for the most part. This year we expanded our questions and asked about emerging networked state devices which may include IoT, unmanned aerial systems (UAS) and other devices. CIOs were asked to describe their state's status and progress related to the management of emerging networked state devices. As in prior years, the majority of CIOs said it was ad-hoc or in the discussion phase (69 percent). However, the percentage of states that have created a roadmap went up from four percent in 2016 to 15 percent in 2017. Similarly, the percentage that stated that emerging networked devices are reflected in their strategic plan went up from nine percent in 2016 to 21 percent in 2017. Also of note, 21 percent said that they are currently defining management processes and procedures. State CIOs are particularly concerned about the security risks of these devices on state networks. Some CIOs commented that some agencies were further along than others, and that they are still focusing on developing a security policy for these devices. As one CIO quipped, "You mean the Botnet of Things, right?"

Although not dramatic, we're seeing growing recognition of the need for CIOs to address emerging technologies by design rather than default.

From an enterprise perspective, how would you describe your state's status and progress related to the management of emerging networked state devices (such as IoT, UAS, etc.)?	
Discussion stage / Ad-hoc	69%
Reflected in IT strategic plan	21%
Roadmap created	14%
Supported by an executive order or policy	10%
Defining management processes and procedures	21%
Established management processes and procedures	2%

Looking toward the near future, we asked CIOs what emerging IT area will be most impactful in the next 3-5 years. The Internet of Things (43 percent) and artificial intelligence / machine learning (29 percent) garnered the majority of responses. Digital assistants and blockchain each received a meager ten percent. With a few states piloting these technologies in 2017, we anticipate continued experimentation and adoption. Despite a constant barrage of media attention and policy discussions focused on connected/autonomous vehicles, that technology only received one vote.

What emerging IT area will be most impactful in the next 3-5 years?



One commenter who chose "other" said they feel that artificial intelligence / machine learning will have a positive impact while IoT will have a negative impact.

From a governance perspective, state CIOs clearly see their role in driving or evaluating investments that have networked technology components as one of "collaborating or advising" as opposed to leading. About two-thirds of respondents (67 percent) said that their role is to collaborate with agencies or departments in decision-making. Given their business model and funding constraints, CIOs have found that collaborating with agencies on emerging technology adoption is the reasonable course of action. Another 14 percent said their role is advising decisions while only five percent felt that their role was to lead decisions. Another five percent said that they identify risks, and ten percent said they have no role.

Comparison of current vs desired roles of CIO in driving/evaluating investments that have networked technology components (IoT, Autonomous Vehicles, UAS)

Role	Current %	Desired %
Leading decisions	5%	26%
Collaborating with agencies/ departments in decision-making	67%	71%
Advising decisions	14%	3%
Identifying risks	5%	0%
None	10%	0%

When this question was altered slightly to be aspirational, CIOs were asked what role SHOULD the CIO have in driving/evaluating these investments. Again the largest percentage was collaborating with agencies/departments (71 percent). However, over a quarter (26 percent) said that the CIO should be leading decisions compared to only five percent who are actually doing that today.

The role of the state CIO in evaluating and implementing these emerging technologies is clearly still being defined. Given the diversity of technologies under consideration – from autonomous vehicles to police body cameras – even the definition of what constitutes "IT" is not always clear. Not all technology comes through the state IT organization, and the role of the state CIO in governance and risk management is still to be determined. As one CIO put it, "It's not my job to push emerging tech; my job is to listen and push them to justify the business need. If they can justify the business need, IT's job is to help them think it through. We have an advisory and consultative role to bring people together."

IT Workforce

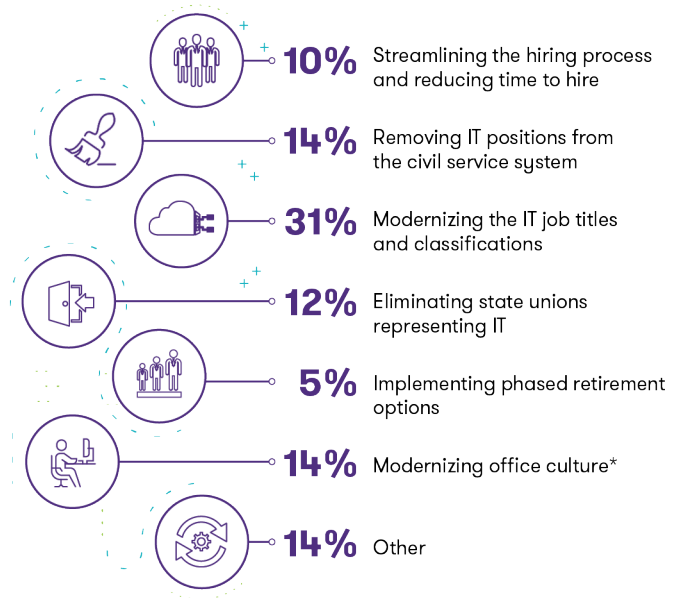
Growing challenges in the arena of state workforce over the past decade plus have been well documented. Take, for example, this excerpt from the National Association of State Personnel Executives (NASPE) 2016 Top Five Issues Panel Discussion Paper:

"Four years into the U.S. economic recovery, employers are about to face challenges that they cannot ignore. Baby boomers are retiring. Millennials are bringing changes in the workforce. Work has been altered by social media, mobile technology and globalization. U.S. employers—public and private—are scrambling to stay ahead of the coming talent shortage and find appropriate and affordable employees for their organizations. This talent shortage will test the resolve of employers..."

State information technology, it seems, faces even greater challenges in finding and keeping qualified talent, especially in the area of cybersecurity, where negative unemployment has been widely reported. Generally, IT job candidates don't perceive state government as an attractive and challenging work environment. Looking at the results from this 2017 survey,

state CIOs are fairly uniform in discussing the barriers to their IT workforce success. Most of the responses are focused on structural and policy reforms to address the outdated practices and overcoming negative perceptions. When asked about the single personnel reform that could be implemented that would be impactful in reforming state IT workforce, "modernizing IT job titles and classifications" was overwhelming ranked highest (31 percent) as it was in 2016.

What single personnel reform could be implemented that would be the most impactful in reforming your State IT workforce?



*(i.e. flexible work schedules, telecommuting, etc.)

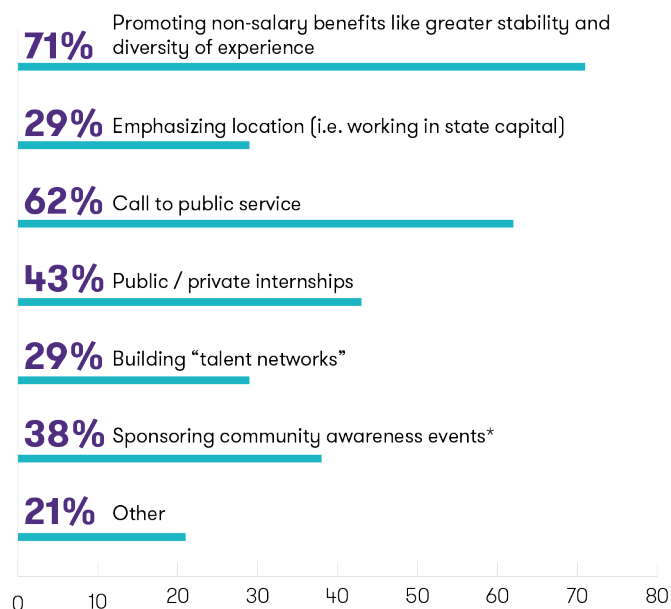
One CIO also remarked that he hoped in the future to be "strategic about the type of workforce / work culture we need for future success and investing in employee technical and soft skills to support that environment."

Tied for second in this ranking is "removing IT positions from the civil service system," "other," and "modernizing office culture" (all at 14 percent). The interesting bit here is that, in 2016,

"modernizing office culture" received 20% of the votes. There are many possible theories for this, especially considering "human resources/talent management" didn't make the State CIO Priorities for 2017 like it did for 2016. However, one might be that the obstacles that CIOs face in merely getting someone in the door (something they can't control as much) are much greater than what they can do to keep someone once they've hired them (much easier for them to control).

In regard to attracting and retaining qualified staff, we asked CIOs to identify all of the innovative and out of the box strategies and tactics they are using. A large percentage (71 percent) said they are "promoting non-salary benefits like greater stability and diversity of experience." This is close to the 2016 survey when it was ranked at 75 percent. "Call to public service" was ranked second with 62 percent and "public/private internships" was ranked at 43 percent. These responses are very similar to data from the 2016 survey.

What innovative / out of the box strategies and tactics has your state used in attracting and retaining a highly qualified IT workforce?



*[i.e. hackathons, robot build events, speaking at STEM schools]

One CIO is driving innovation and out of the box strategies in the IT workforce by "establishing lasting, cross-domain partnerships and longitudinal collaboration/coordination that provide mutual benefit and lasting networks that, in turn, draw top talent to want to be a part of this exciting and innovative work."

We also asked if there had been a significant change in the CIOs organization culture that has improved or impeded the ability to recruit and retain qualified IT talent. To be expected, many CIOs noted that pay has impacted their organization—positively for some and negatively for others. Others noted that implementing work from home policies, incremental and results-driven approaches, more modern technology and training programs have aided in their recruitment and retention efforts.

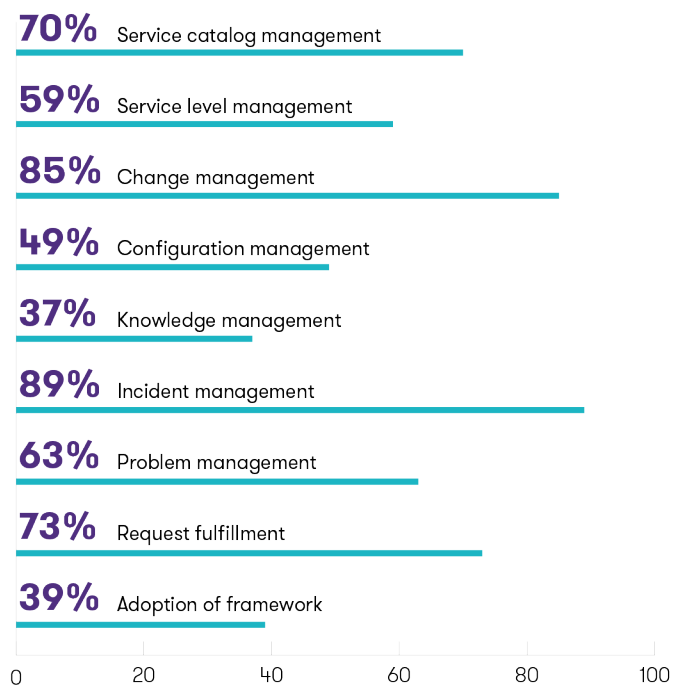
Finally, within this topic we posed a new question to state CIOs: "Do you have someone in your CIO organization with primary responsibility for IT workforce initiatives including talent management, recruitment, and employee development and branding?" Surprisingly, only 17 percent have this position within their CIO organization. This tactic clearly deserves more attention by CIOs as they strive to compete in the marketplace for IT talent. Anecdotally, we know from states like Colorado, Maine and Minnesota, who have dedicated resources to talent management, that there are significant benefits to this approach.

Consolidation

Consolidation and Optimization is the number two priority in the NASCIO list of State CIO Top Ten Policy and Technology Priorities for 2017. In past years we have asked CIOs about the specific systems, technologies and resources that their states are consolidating, and we have observed slow but steady progress each year. This year, we asked CIOs to report on some of the operational and governance processes that enable and oversee consolidation efforts. In particular, we asked about the degree that formal IT Service Management (ITSM) processes are being employed in their states, and the extent to which application portfolio management is being used.

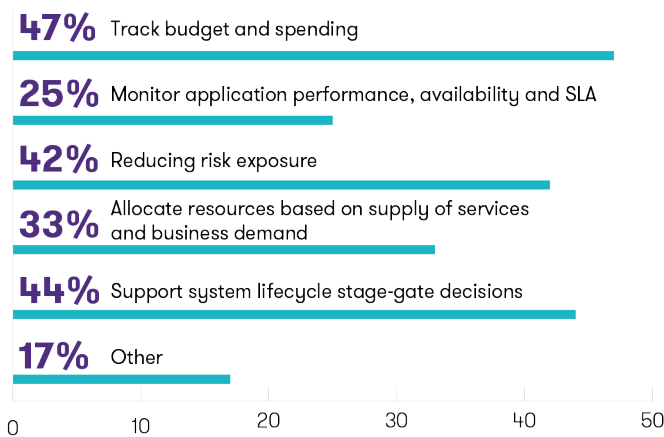
We began by asking CIOs for which ITSM processes had their states implemented a defined process and supporting toolset. Responses varied significantly. In general, change and incident management had the greatest coverage, with formal processes established in approximately 85 percent of states. Service catalog management and request fulfillment followed closely behind, with about 70 percent of states reporting defined processes and supporting tools. The other process areas fell generally in the 40-60 percent range. Notably, even though defined processes are quite widespread, only 39 percent of CIOs reported the adoption of a specific framework (such as ITIL) to support the definition of these processes.

For which ITSM processes have you implemented a defined process and supporting toolset?



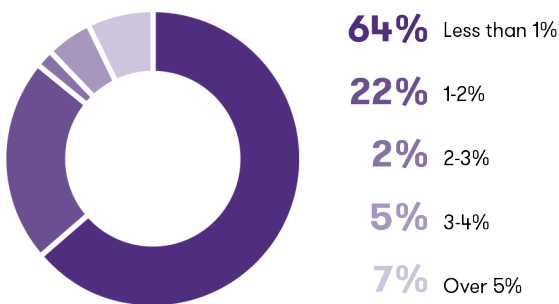
Turning to application portfolio management, we asked CIOs how their organizations use this function. CIOs reported a variety of uses, with the tracking of project budgets and spending being the most common. Other common uses with supporting project stage-gate decision-making and reducing application portfolio risk exposure. Only a third of CIOs reported using application portfolio management to prioritize and allocate resources. One quarter of CIOs also use this function and supporting tools to track application performance and adherence to Service Level Agreements.

How does your organization use application portfolio management?



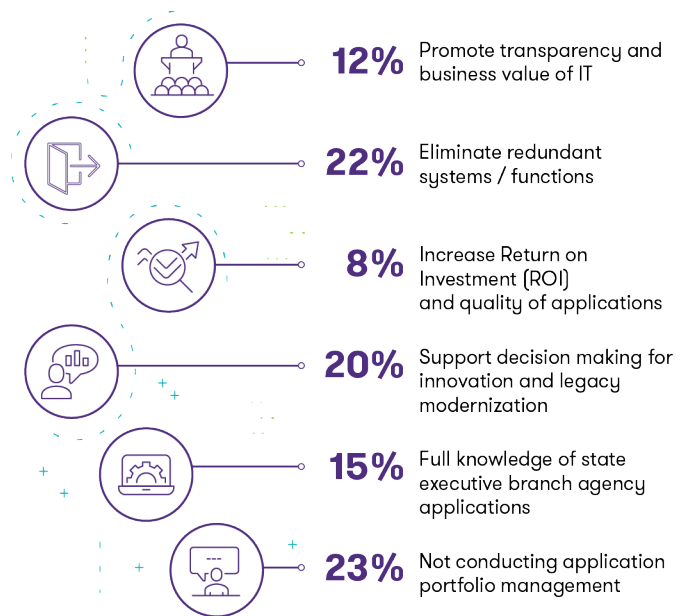
We asked CIOs how much of their organization's budget was allocated to application portfolio management. Almost two thirds of CIO organizations spend less than one percent of their budgets on this function, although seven percent reported dedicating over five percent of their budgets. As state CIOs continue to consolidate and expand brokered services, we fully anticipate these investments to grow.

What percentage of budget does your CIO organization allocate to spend on application portfolio management annually?



CIOs reported the main benefits of application portfolio management as helping to eliminate redundant systems and supporting decision-making. Promoting transparency and the business value of IT, and gaining visibility into the full suite of agency applications were also considered significant benefits.

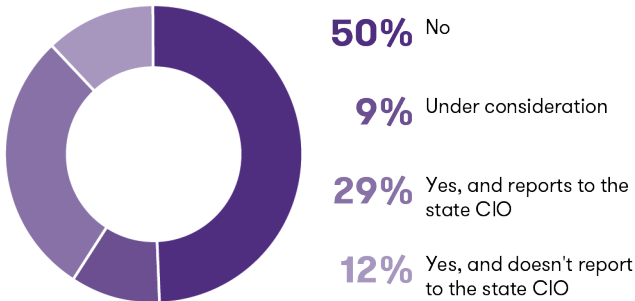
What is the top benefit of application portfolio management for your CIO organization?



Data Management and Analytics

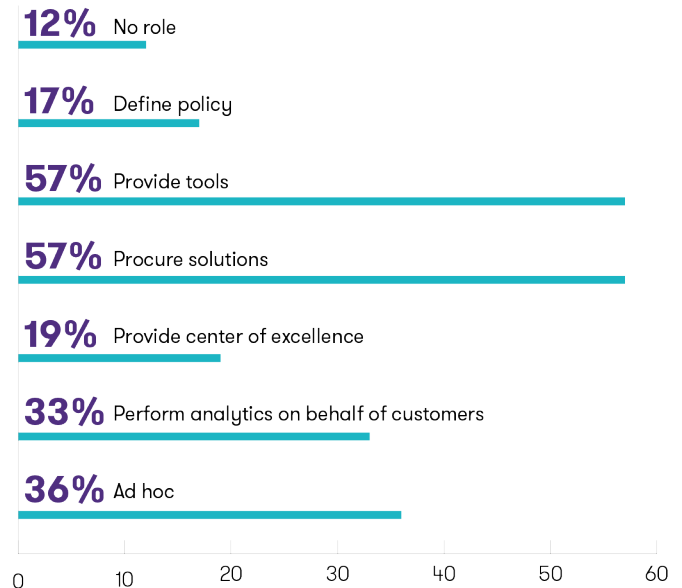
Our 2017 survey included questions surveying high-level practices to identify trends and understand how CIOs are supporting their state's ability to analyze information. In 2016, we asked CIOs for the first time about the role of the Chief Data Officer (CDO), and whether their states had created the position. We asked the same question again in 2017 and the survey revealed that several states have progressed from considering a position to having one. Interestingly, there was no movement for states that do not have a CDO and are not considering adding one.

Does your state have a Chief Data Officer (or equivalent)?



We also specifically asked CIOs about the types of services that they provide to their states to support data analysis. As data management practices continue to mature in each state, less effort will need to be spent organizing data. As a result, there will be increasing opportunity to develop analytics to drive insight from data. Our survey results indicate significant variance between states relating to CIO involvement in enabling data analytics capabilities for their customer base. Over half of the state CIOs indicated that they are providing tools and solutions for their customers. One in three are performing analytics on behalf of their customers while one in six are involved in policymaking. At the other end of the spectrum, 12 percent of CIOs specified that they have no role in supporting their customers' data analysis efforts.

How do you service the data analytics needs of your customer base?



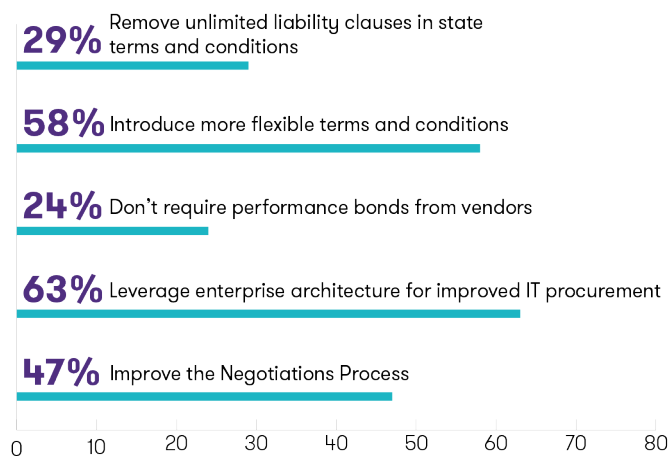
Procurement

Modernizing state IT procurement has been both a challenge and priority for state CIOs for many years. In many iterations of this CIO survey, state CIOs have been consistently dissatisfied with the state IT procurement process (one half of the respondents in 2015, for example). Because of this general level of discontent, frustration and calls for reform, NASCIO issued a call to action to states in early 2016, endorsed by CompTIA and the National Association of State Procurement Officers (NASPO), which included the following recommendations to states:

- Remove unlimited liability clauses in state terms and conditions
- Introduce more flexible terms and conditions
- Don't require performance bonds from vendors
- Leverage enterprise architecture for improved IT procurement
- Improve the negotiations process

In an effort to gauge progress with these recommendations, we asked respondents to identify all steps in the call to action states have addressed. Sixty-three percent said they were leveraging enterprise architecture and 60 percent said they had introduced more flexible terms and conditions. The focus on these specific responses are not surprising on two fronts—by late 2016 most states have already eliminated unlimited liability clauses, thus not a change most CIOs would cite. Likewise, the use of performance bonds on IT projects has dwindled and been essentially abandoned by states in recent years.

Which of the following areas identified in the call to action has your state taken steps to address?



Conversely, improving negotiations is something CIOs have consistently identified as a priority in state IT procurement projects. State CIOs desire to have more flexibility to negotiate during the procurement process and are stymied by existing statutes and policies. Given this imperative, earlier this year NASCIO partnered with the NASPO to address negotiations in state IT procurement. Recommendations from this joint task force will also be released in the fall of 2017.

The last question in this section asked CIOs to rate the effectiveness of their state's IT procurement process within three dimensions: getting the best cost-savings, value, and innovative technology. CIOs generally think that their state is effective in getting cost-savings and value, however two-thirds are undecided on if they are getting the most innovative technology – neither effective nor ineffective. This is consistent with the work of the NASCIO-NASPO Task Force on Negotiations, where both CIOs and chief procurement officials (CPOs) were asked the same question. Some insight into perhaps why state CIOs are not convinced they are getting the most innovative technology lies in comments we received like, "the current infrastructure supplier contract is 11 years old and was not designed for innovation" and "low bidder remains a key grading parameter which reduces our effectiveness." With the pressure on CIOs to deliver more innovative solutions, it's imperative for IT procurement processes to align with the transformation and innovation agenda.

How effective would you say your current IT procurement process is at the following:					
	Very effective	Effective	Neither effective nor ineffective	Ineffective	Very ineffective
Getting the most cost savings for your state?	17%	45%	24%	12%	2%
Getting the best value for your state?	12%	40%	33%	12%	2%
Getting the most innovative technology available for your state?	12%	24%	40%	19%	5%

Conclusion

State CIOs continue to address a wide range of issues driving change in their organizations. Some issues, such as the evolution in business models from direct provider to the broker, are continuations of trends that have developed over many years. Others, such as the emergence of new categories of networked technologies, raise questions about what should even be considered "IT". The accelerating pace of change is compounded by the confluence of so many factors simultaneously impacting CIOs.

Together, these drivers constitute a new engine for both disruption and transformation, and in response, CIOs are rethinking the role and structure of their organizations. CIOs have shared with us a snapshot of their innovations, from establishing dedicated digital government organizations to the widespread exploration of DevOps practices and migration of mainframe services to the cloud. The ability to sustain transformation and innovation in the face of changing circumstances will continue to be a hallmark of the successful state CIO organization.



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Acknowledgments

We thank state CIOs for participating in this year's survey – the response rate was excellent. We also acknowledge the support and contributions of the sponsoring organizations and the time and expertise of the individuals listed below.

To obtain copies of this report and the survey questionnaires, go to any of the websites listed below.



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