



Data quality - vital to optimizing GenAI

A survey of state chief information officers and chief data officers



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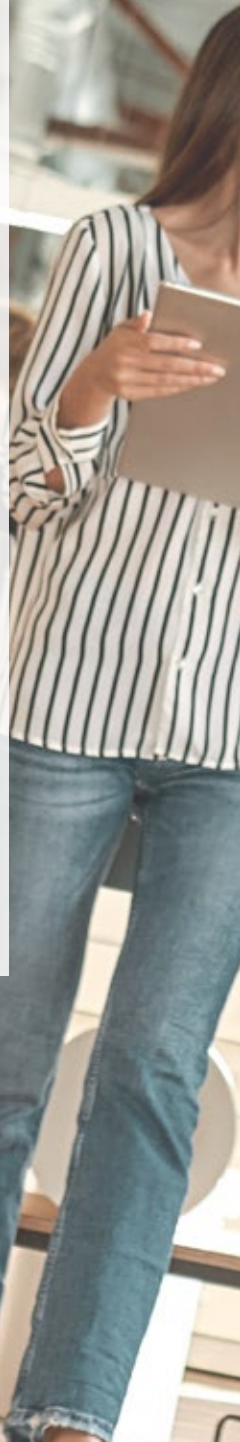
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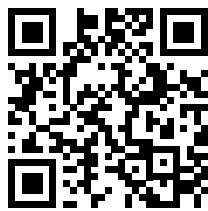


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For more information on
data management, see
NASCIO's resource center.

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Executive summary

For state and local government executives, the imperative of maintaining high-quality data cannot be overstated. Accurate data is the cornerstone of insightful analytics, strategic decision-making and the effective training of artificial intelligence (AI) models. That is why we decided to gauge the feedback of state chief information officers (CIOs) and state chief data officers (CDOs) through a collaborative, national survey. Ninety-five percent of the respondents believe that increased adoption of AI and generative AI (GenAI) will impact the importance of data management. The resulting report, which is based on responses from 46 states, indicates that state governments are grappling with the establishment of comprehensive, enterprise-wide data quality programs.

An effective data quality program is essential for proactively managing state government data and identifying where investment in data quality efforts can yield the most significant return on investment. Moreover, there is a notable gap in the availability of skilled personnel required to develop and maintain an operational framework that maintains the sustainability of data quality.

The discrepancy between the recognized importance of data quality and the implementation of programs to safeguard it can be attributed to factors such as business drivers, budget limitations, lack of necessary skills, organizational awareness and other competing priorities. These challenges are magnified when attempting to address data quality at the enterprise level, where the complexity and scope of the task increase substantially.

This report will highlight key findings from our 46 state respondents, emphasizing the critical role of data quality within their respective organizations. It will discuss the strategic considerations for building the necessary teams and skill sets, the adoption of technology solutions for data quality monitoring and the creation of ongoing data quality initiatives. These actions are vital for enhancing the value of data, which in turn supports the delivery of superior services to residents.



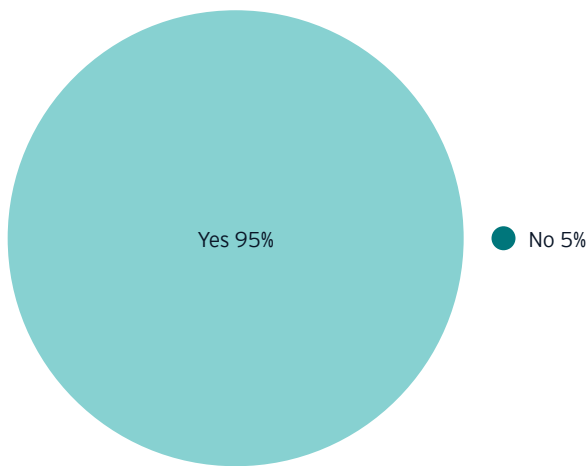
KEY TAKEAWAYS

AI-readiness extends data quality considerations

As AI and GenAI technologies rapidly ascend to prominence, state governments are compelled to scrutinize and prepare their data landscapes to harness these technologies for enhancing for residents services. The inclusion of AI on NASCIO's 2024 Top Ten Priorities list is a testament to its growing importance.

FIGURE 1

Do you anticipate increased adoption of AI and GenAI impacting data management importance?



Data quality was presented as a key consideration in NASCIO's report *Your AI Blueprint: 12 Key Considerations as States Develop Their Artificial Intelligence Roadmaps*, demonstrating its high importance to effectively deploying AI and GenAI capabilities.

When it comes to AI-ready data, there are seven key points to consider:

- 1. AI-ready data strategy:** Build and execute data strategies focused on enabling the rapid development and deployment of AI and GenAI solutions.
- 2. Knowledge management:** Reorganize and integrate organizational knowledge stored in structured, unstructured and novel data sources traditionally outside of data management.
- 3. Data governance:** Enable data scientists and AI/machine learning (ML) engineers to quickly and accurately discover, explore and use novel data sources to efficiently build new AI and GenAI solutions.
- 4. Master data management:** A single source of truth for core datasets reduces the potential for inaccurate AI results and increases trust in AI solutions.
- 5. Data risk and compliance:** Reduce the risk of AI/GenAI solutions introduced through inaccurate data, poorly maintained data and improper access controls.
- 6. Data quality:** AI is only as good as the data you feed it. Ensure the quality of your AI and GenAI solutions with curated and validated data.
- 7. AI-ready data architecture:** Data is thoughtfully curated in a way that enables exploration for rapid prototyping and that supports large AI/GenAI solutions as they scale.

The caliber of data is a critical determinant of successful AI. The efficacy and dependability of AI systems hinge on the quality of the data used for training. High-quality data equips AI models to discern patterns, forecast outcomes and aid in decision-making with precision. Conversely, substandard data can engender biased or erroneous AI outputs, encapsulated by the adage “garbage in, garbage out.”

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Data quality is the biggest challenge for data and AI across the board, for all states.



Rebecca Cai
CDO, State of Hawaii

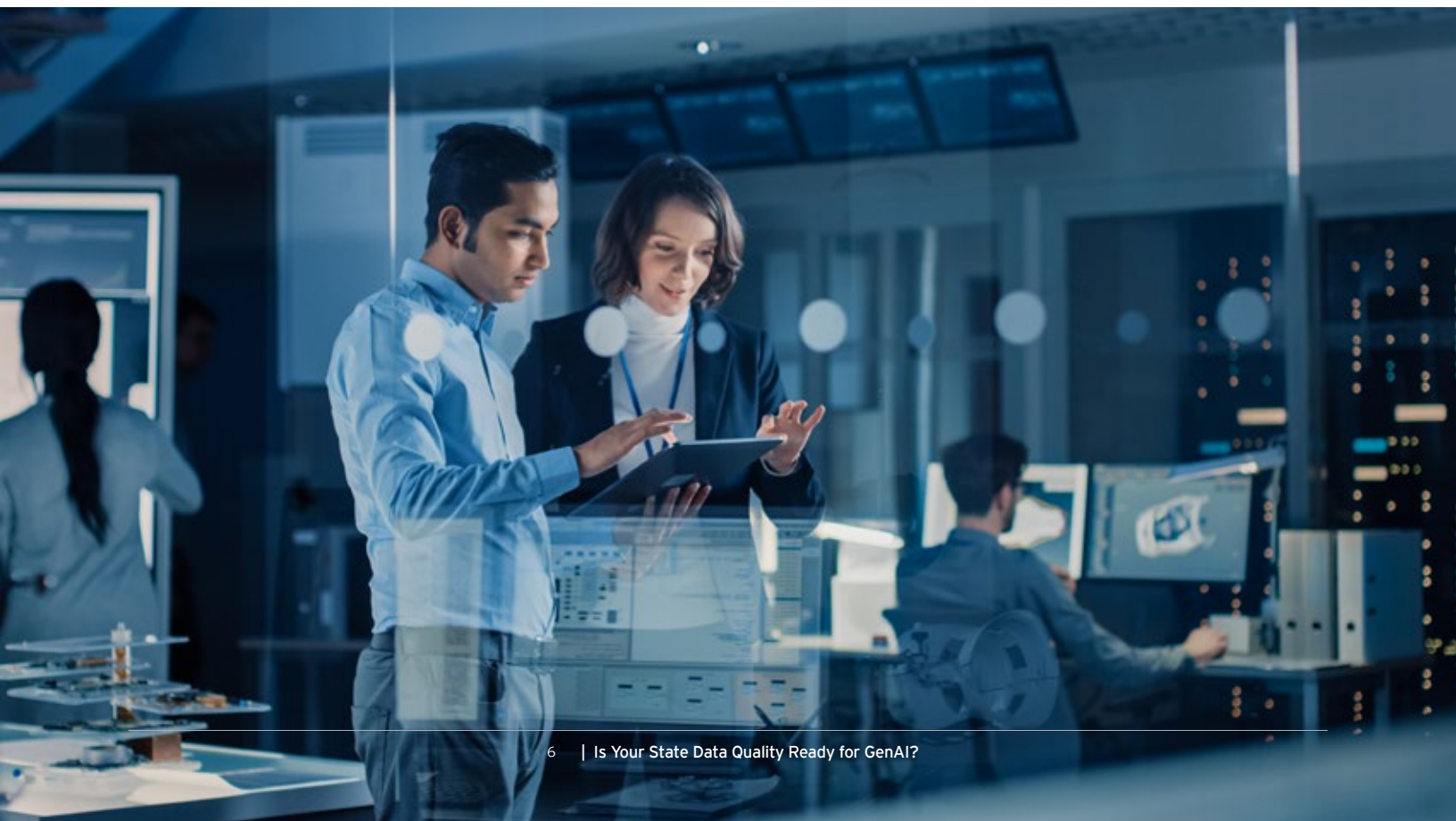
This challenge is acknowledged by **Daniel Urquhart, CIO, Alabama**, who noted a keen interest in GenAI among agencies, alongside the recognition that GenAI's potential is contingent upon the integrity of the underlying data. This perspective is echoed in our survey (Figure 1), where an overwhelming 95% of respondents anticipate that AI and GenAI will amplify the significance of data management, yet a mere 22% have an established data quality program.

Bill Smith, CIO, Alaska, expressed concern over the temptation to bypass the issue of poor underlying data by crafting specialized, curated data sets for AI applications. He warned against the daunting prospect of managing “hundreds of different pockets of data,” advocating instead for a concerted effort to implement comprehensive data quality management.

Robert Osmond, CIO, Virginia, reinforced this view, emphasizing the state's commitment to ensuring that the foundational data for AI, particularly large language models (LLMs), must be reliable and of high quality. So that AI is ethical, responsible, and transparent, the foundational data used for AI must be accurate, and the results of the AI must be thoroughly tested for accuracy. Virginia's Executive Order 30 and associated AI policies and standards provide a framework for the proper use of AI.

The momentum to formalize data and AI policies is gaining traction across states. Ohio has introduced a policy governing AI use, and Hawaii is on track to unveil a data and AI strategy. Additional essential steps that states must take in this direction include defining critical data elements and data quality business rules, establishing a data quality framework, and consistently measuring and monitoring data quality.

The culmination of these efforts is an organization with advanced data quality maturity, poised for AI and GenAI applications. Such an organization benefits from datasets that are pristine and primed for GenAI, yielding superior outputs. It boasts automated and consistently applied data validation processes; uniform data standards, formats and naming conventions; and robust key performance indicators (KPIs) and metrics that provide a comprehensive understanding of data quality for each dataset. Furthermore, it maintains a dynamic system of data quality business rules that proactively adjust to evolving business needs and data landscapes. Ultimately, investment and organizational commitment to data quality can ensure that the application of AI and GenAI applications deliver the insights policymakers need for effective decision-making and positive for residents outcomes.





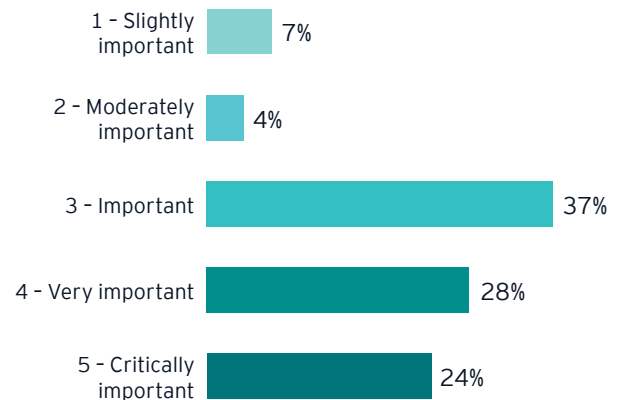
Data quality needs data governance

In the realm of data management, quality cannot stand alone. For organizations to enhance their data quality effectively, it is imperative to develop a robust data strategy that incorporates comprehensive data governance. A comprehensive data governance operating discipline will include multiple dimensions, examples of which are presented in the [DAMA International Data Management Body of Knowledge](#). All of these dimensions must eventually be in place to achieve what we are stating in this report. All too often, data within organizations is not treated as the valuable asset it is. When it is managed, it tends to be siloed, with individual teams creating their own standards in isolation.

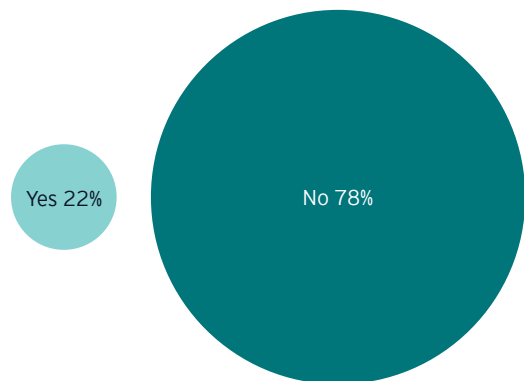
Additionally, efforts to cleanse data and improve its quality are frequently conducted as one-off projects. As seen in Figure 2, the significance of data quality is widely acknowledged, with 89% of CIOs considering it to be of high importance. Despite this, only 22% have implemented a dedicated data quality program. Discrete data quality efforts may exist within individual state agencies or programs; however, this is the exception. This approach leads to a cyclical pattern of manual re-cleansing due to the absence of ongoing monitoring mechanisms and designated data stewards or owners to maintain the integrity of the data over time. Effective data quality management moves the effort as much as possible to the start of any data lineage, preventing data errors on the front end rather than data correction activities later in that lineage. An important principle to solve data quality problems at the source rather than downstream.

FIGURE 2

How would you rate the importance of data quality in your organization?



Do you have a data quality program?

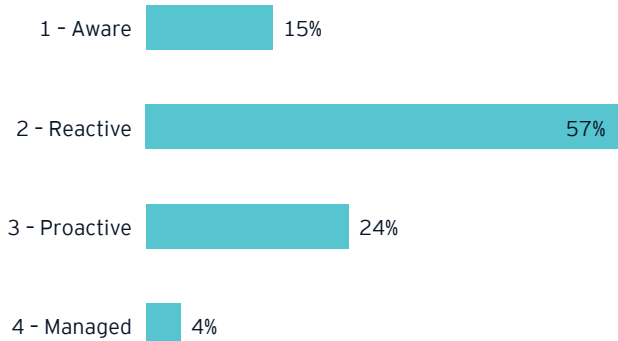


It is essential for state governments to balance their investments across all areas of data management, so that data quality is not just an afterthought, but a key priority that underpins all other data initiatives.

As illustrated in Figure 3, the majority of states are in the nascent stages of developing their data quality initiatives. More than half of them self-assess their data maturity as “aware” or “reactive.” This reflects a widespread lack of understanding of data quality principles, a deficiency of formal programs to foster improvement and a tendency to view data quality as a technology agency’s responsibility rather than a cross-departmental concern. This is not surprising given the lack of formal data governance in the majority of states.

FIGURE 3

How would you rate the maturity of data quality in your organization?



In the case of Hawaii, efforts are underway to construct a data governance framework. **Rebecca Cai, CDO, Hawaii**, has identified the framework’s essential elements, which include policies, guidelines, data quality standards, data qualification processes and data privacy considerations. North Dakota has initiated its journey toward data governance with the publication of a data classification policy and standard. **Kimberly Weis, CDO, North Dakota**, regards this as just the beginning, expressing optimism that it will lay the groundwork for a stronger emphasis on data quality.

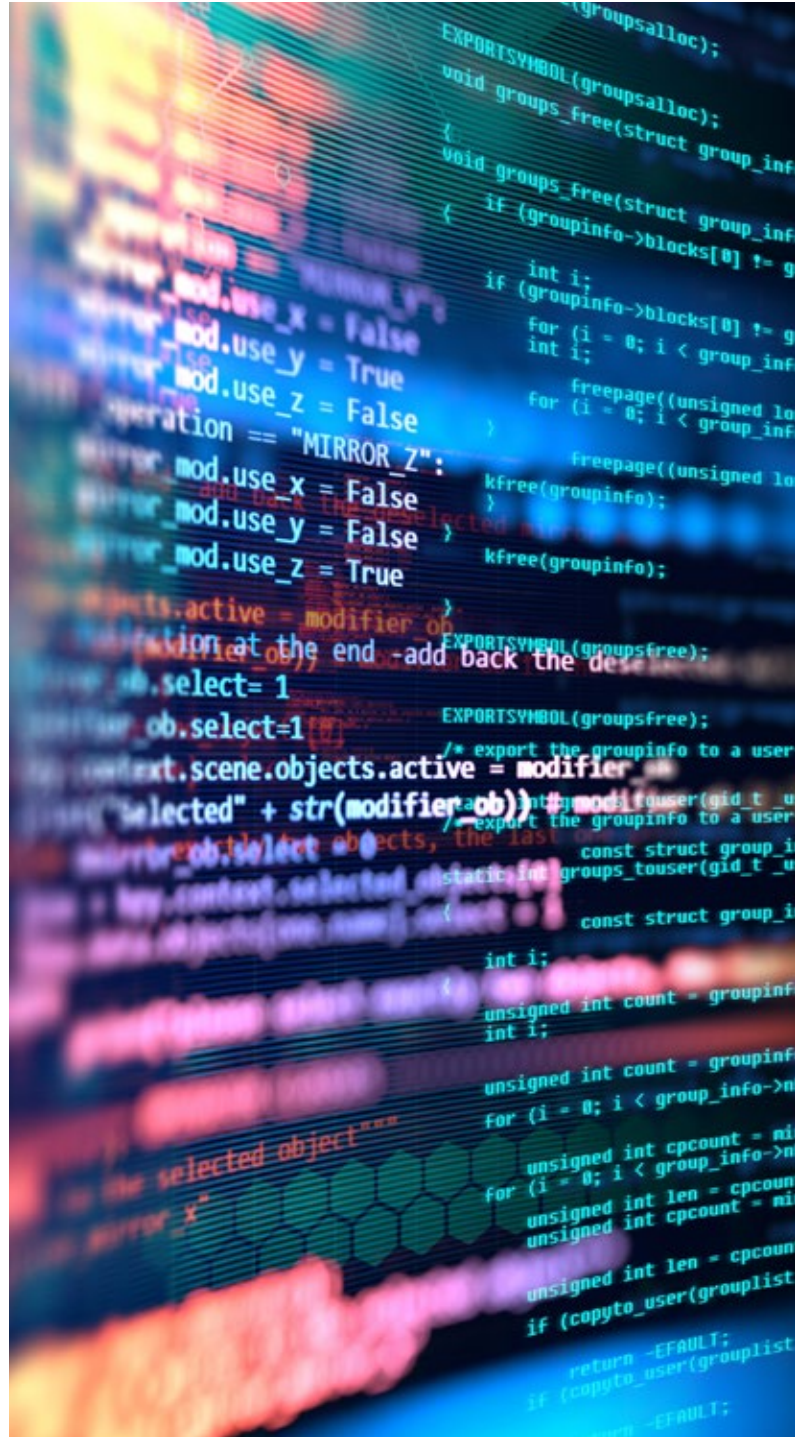
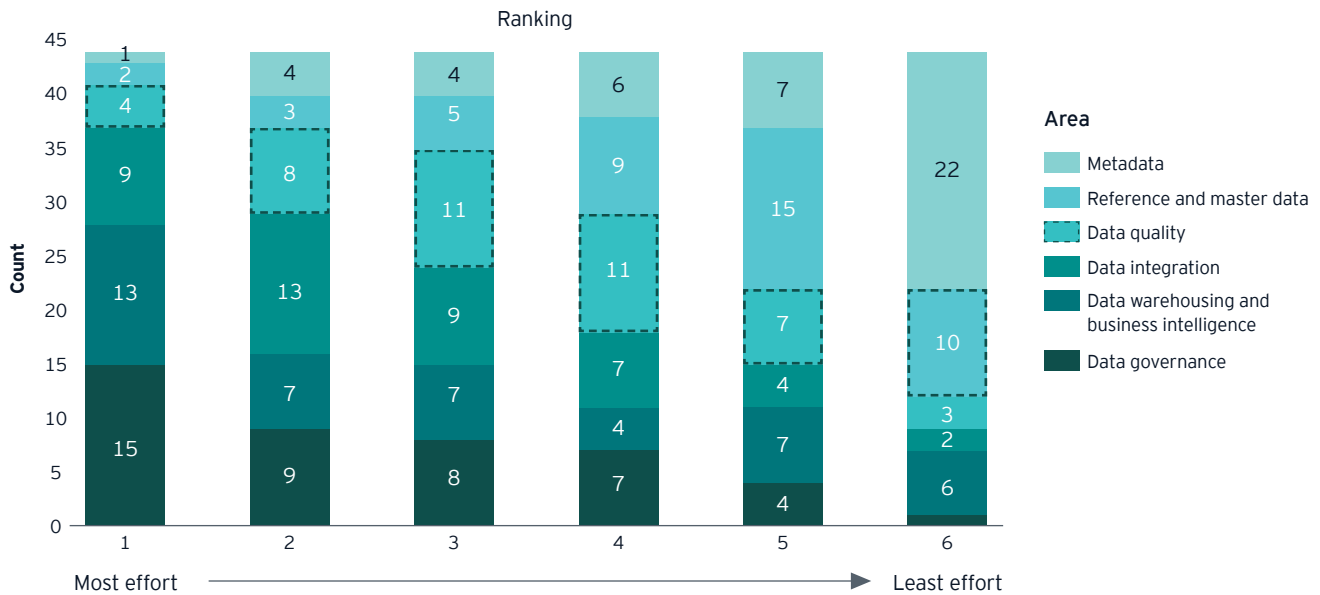


FIGURE 4

Rank each data management knowledge area based on the amount of effort or focus allocated toward each in your state government (i.e., 1 - most effort, 6 - least effort)



Despite the challenges, there is a concerted effort among most states to prioritize data governance, data warehousing and analytics, and data integration. State efforts are now accelerating because of the perceived promise of GenAI to address opportunities in productivity, government operations and improving digital services to residents. The success of efforts in these areas is inherently tied to the quality of the underlying data. Yet, when we asked survey respondents to rank six data management knowledge areas by their state's level of involvement (Figure 4), it became evident that while states are actively engaged in the aforementioned areas, data quality itself is receiving comparatively less attention in terms of resources and effort.

This disparity underscores the need for a shift in focus. States must recognize that without a solid foundation of data quality, other data management efforts may not reach their full potential. It is essential for state governments to balance their investments across all areas of data management, so that data quality is not just an afterthought but a key priority that underpins all other data initiatives.

Data quality importance is not aligned with budget and policy

The previously mentioned disconnect between the importance that state CIOs assign to data quality and the actual number of dedicated data quality programs appears to align with our survey results concerning states’ budgets and policies. States have expressed that acquiring executive buy-in and support remains a top challenge to implementing data quality initiatives. This support is crucial, as it often determines whether data-centric mandates are incorporated into legislation, which is essential for the sustainability of data management programs.

For data management efforts to be truly effective and enduring, they must be institutionalized through executive orders or, more reliably, through legislation. Legislation offers permanence to data management programs, ensuring their continuity beyond the tenure of current administrations, whereas executive orders are vulnerable to reversal with changes in leadership.

Figure 5 starkly illustrates the misalignment between the perceived importance of data quality and the funding allocated to it. While most states acknowledge the

significance of data quality, categorizing it as important or even critically important, the alignment of funding does not reflect this stance, with most states reporting low to medium budgetary alignment.

To secure the necessary budget and resources for data management and data quality, it is imperative to present the case from a nontechnical perspective that resonates with policymakers. **Tracy Barnes, CIO, Indiana**, emphasized the importance of framing the discussion correctly, noting that “policymakers are funding the outcome of the service” rather than the abstract concept of data quality.

Amanda Crawford, CIO, Texas, pointed to a [2021 Texas law](#), which is aimed, in part, at enhancing data governance and integrity, and at facilitating data sharing across government entities. The law reflects a growing recognition of the need to invest in the infrastructure that underpins effective data management and quality, acknowledging that such investment is integral to the delivery of efficient and effective government services.

FIGURE 5

How does data quality importance align with the amount of funds budgeted toward data quality initiatives?

		Alignment with funding			
		1 - No alignment	2 - Low alignment	3 - Medium alignment	4 - High alignment
Importance of data quality	1. Slightly important		1	2	
	2. Moderately important	1	1		
	3. Important	2	11	4	
	4. Very important	2	8	3	
	5. Critically important	2	5	3	1



Unlocking data quality requires the right people and skill sets

The pursuit of data quality is a multi-faceted challenge for state governments, and one of the most significant hurdles is the scarcity of specialized talent. The roles essential for fostering data quality encompass a wide range of responsibilities and expertise, each contributing uniquely to the lifecycle and integrity of data.

Data steward:

- ▶ **Role:** Acts as a guardian of data, safeguarding that it is managed properly across its lifecycle.
- ▶ **Contribution:** Defines data standards and policies, resolves data quality issues and works to align data governance with business objectives. They seek to establish that data is used responsibly and meets quality benchmarks.

Data quality analyst:

- ▶ **Role:** Specializes in analyzing and improving the quality of data.
- ▶ **Contribution:** Identifies, analyzes and resolves data quality problems. They develop and implement data quality metrics and reports, and also work to ensure that data across the organization is accurate, complete and reliable.

Master data management (MDM) analyst:

- ▶ **Role:** Focuses on the management and governance of core business entities, often called master data. This includes customers, products and employees.
- ▶ **Contribution:** Enables accurate, consistent and up-to-date master data across the organization. Establishes and enforces guidelines for data entry, maintenance and usage, which are crucial for maintaining high-quality data.

Data analyst:

- ▶ **Role:** Interprets data and turns it into information that can offer ways to improve a business, thus affecting business decisions.
- ▶ **Contribution:** While analyzing data, they often identify quality issues and inconsistencies that need to be addressed. They help in validating and cleaning data, which contributes to overall data quality.

Solution architect:

- ▶ **Role:** Designs the structure of the IT system so that it aligns with business goals.
- ▶ **Contribution:** Sees that the data architecture supports data quality management. They design systems and processes that facilitate high-quality data as well as the automation and scaling of data quality monitoring mechanisms.

Dashboard developer:

- ▶ **Role:** Specializes in creating data visualization tools and dashboards that help users understand complex data at a glance.
- ▶ **Contribution:** By designing and developing dashboards, they highlight data quality issues through visual means, making it easier for organizations to identify and rectify problems. They also help facilitate that accurate, timely data is presented.

Data engineer:

- ▶ **Role:** Focuses on the practical application of data collection and data processing.
- ▶ **Contribution:** Builds and maintains the organization's data pipeline systems. Sees to it that data flows smoothly from source to destination. It must be properly formatted and stored, and then must be accessible. The data engineer plays a key role in providing accurate and consistent data in a manner that meets the organization's data quality requirements.

The talent gap in these critical roles is evident from our survey results, as shown in Figure 6. States are recognizing this gap and are taking legislative steps to bridge it. For instance, Texas legislation enacted in 2021 mandates that state agencies with at least 150 full-time employees are required to appoint a data management officer.

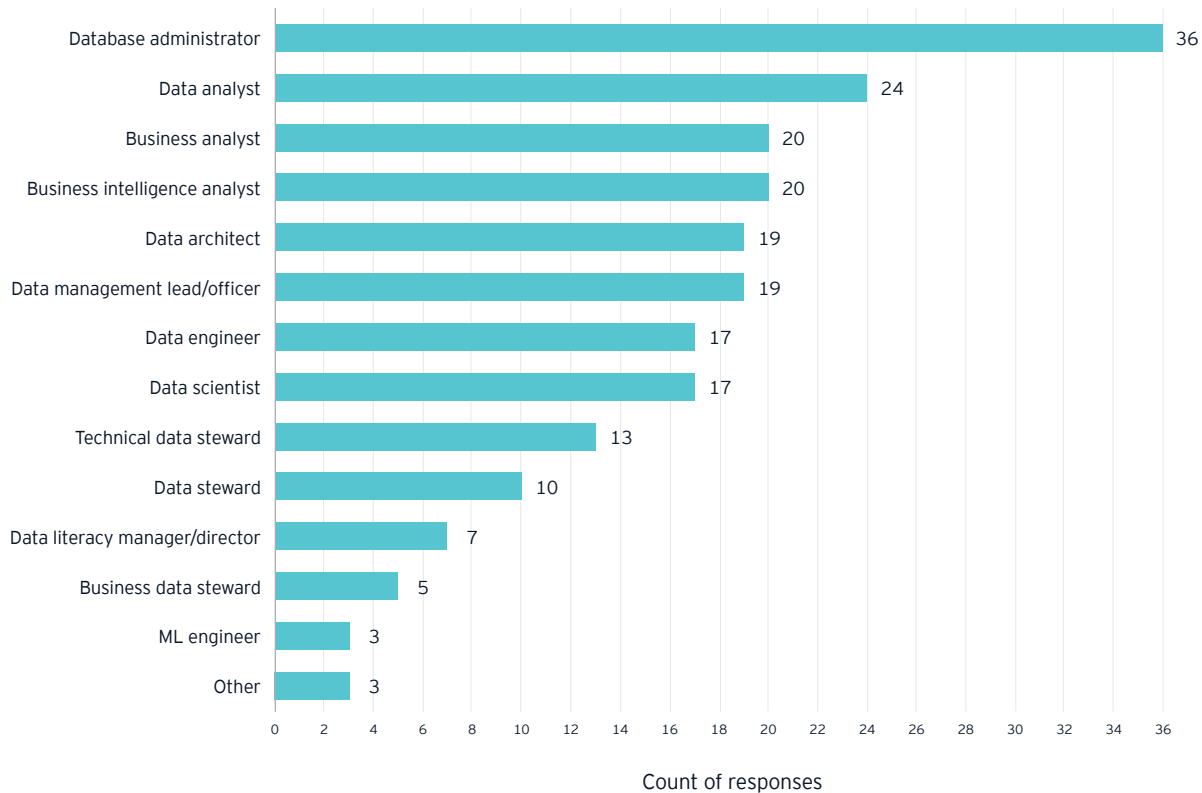
Other states are beginning to call out the need for the critical role of data stewards in their governance policies. **Terrence Woods, CIO, Oregon**, reported, "Data stewards are critical to effective data governance. Our state data governance policy highlights the importance of agencies' having a lead data steward to act as a sustainer and leader for agency data."

Similarly, business processes must accommodate the fundamental need for data management and data quality. "Arizona has integrated data management into the business process of the project investment justification (PIJ)," **J.R. Sloan, CIO, Arizona**, told us. "Questions about data and data management are raised as we plan for and prepare projects to modernize legacy platforms."

These initiatives underscore the growing awareness and proactive measures that some states are taking to embed data management and quality into the fabric of state government operations.

FIGURE 6

What types of data roles are prevalent in your IT organization?





Scaling data quality through various data governance operating models

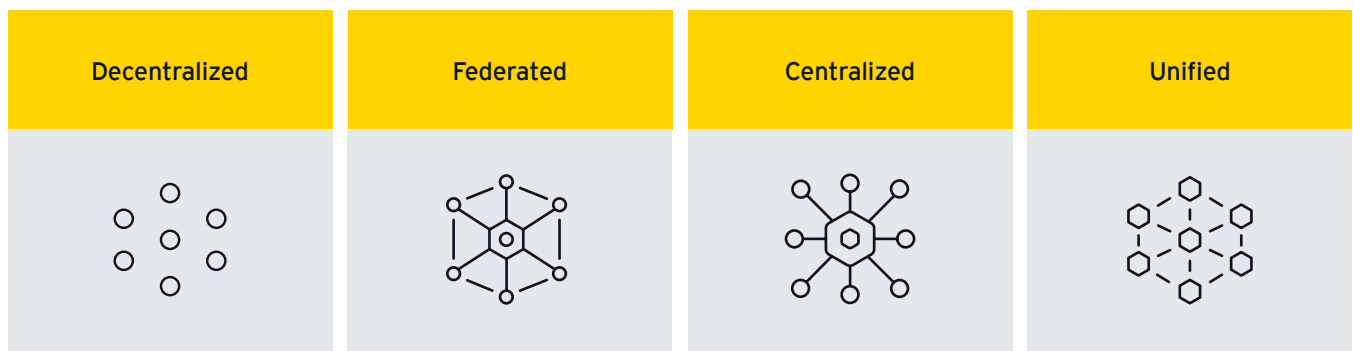
Delivering digital services is tied for No. 1, alongside cybersecurity and risk management, in NASCIO's Top Ten Strategies, Management Processes and Solutions report on [NASCIO's 2024 Top Ten Priorities](#) list and states must do so despite varying data governance operating models.

Figure 7 illustrates a spectrum of operating models, from most federated on the left to fully centralized on the right. In the context of data quality, the operating models of federated, balanced and centralized governance each have unique implications.

In a federated model, individual agencies can address data quality issues that are most relevant to their specific operations, leading to specialized solutions and quick local responses to data quality problems. It also supports the development of expertise in managing the quality of diverse data types within different domains. However, inconsistent data quality standards across the organization can make it difficult to ensure a uniform level of data quality. Integrating data from various units can be problematic due to these disparities, and there may be a lack of a unified view of data quality metrics.

FIGURE 7

A spectrum of operating models



Several states interviewed exhibited a federated approach to data governance and data quality. **Alan Fuller, CIO, Utah**, has experienced these challenges up close. “Utah is trying to do more digital delivery of government services,” he said, “and then we have this other angle of data privacy, data sharing, needing to collaborate across agencies to effectively address some of our big societal problems. Everybody has got their arms firmly wrapped around a different leg of the elephant.”

The matter of data ownership also poses a challenge. **Tracy Barnes, CIO, Indiana**, explained that some agencies consider data theirs if it originated there. “The ownership is there because agencies still think they own their own data – that they’re not part of the state as a whole,” he said.

Some states that are federated will take on enterprise-wide data quality initiatives. This will require effective leadership and organizational change management discipline to create a consistent enterprise-wide approach with pooled resources, such as funding and workforce.

The imperative for data quality has been compared with state governments’ cybersecurity journey. Initially, as numerous disconnected efforts, it was inadequate. However, with a consistent, orchestrated level of effort with consolidated funding, roles and responsibilities, cybersecurity initiatives have become much more effective.

Kathryn Helms, CDO, Oregon reported that inconsistencies between data partners in data collection and reporting can make aggregation at the state level difficult. “The state relies on many external partners to collect data on our behalf,” Helms notes, “each with their own data collection authority and standards. This means that the state is not always the authority on data standards, but rather these standards have to be developed collaboratively.” Balanced and centralized governance operating models may offer relief to some of these challenges but not without their own shortcomings. A balanced data quality model combines centralized standards with decentralized execution, ensuring uniform data quality while accommodating local needs. It supports inter departmental collaboration and enterprise-wide adopted data management discipline but requires careful coordination and role clarity to avoid conflicts and ensure adherence to standards.

Centralized data quality ensures uniform standards across the organization, streamlining compliance and accountability. However, it may not cater to specific departmental needs and can slow issue resolution due to potential bottlenecks. Resource demands and resistance from departments accustomed to self-management are additional considerations.

Ultimately, selecting a data quality model requires aligning with the state’s overarching data quality goals, understanding the nature of data across agencies, and assessing the ability to maintain quality initiatives enterprise wide.

“
The state relies on many external partners to collect data on our behalf.”



Kathryn Helms
Oregon CDO



Drive data quality impact with strategic prioritization

In the quest to elevate data quality within state governments, a strategic approach necessitates prioritizing critical data elements that align with overarching state priorities and objectives. These critical data elements serve as the linchpins of information systems, enabling key services such as education, housing and public safety. By focusing on these elements, states can establish that their data quality initiatives have the most significant impact on the community and the efficiency of government operations.

While data quality is always essential, data classifications may depend on your needs, said **Greg Hoffman, CIO, North Dakota**. “Early strategic steps in data management include collaboration with agencies to determine their need,” he said. “What capabilities do they need to fulfill their mission? What priorities do they have, and how will quality data enable them?”

State priorities such as improving educational outcomes and expanding affordable housing options are heavily reliant on the integrity of data. High-quality data feeds insight enabling analytics, which in turn enables policymakers to make informed decisions, allocate resources effectively and track the progress of initiatives aimed at serving the public interest. Therefore, data quality initiatives should be tailored to enhance the accuracy, completeness and timeliness of data related to these priority areas. This targeted improvement ensures that the most critical services are supported by the best possible data, facilitating outcomes that truly reflect the needs and goals of the state.



Early strategic steps in data management include collaboration with agencies to determine their need. What capabilities do they need to fulfill their mission? What priorities do they have, and how will quality data enable them?




Greg Hoffman
North Dakota CIO

"A 911 dispatcher using GIS [geographic information systems] data needs to have high-quality data to ensure the first responder gets to the right address," said **Christie Burris, CDO, North Carolina**. "Aggregate trend data may not require the same level of accuracy. States will always be challenged by low-quality data due to wide variability in collection methods and/or inconsistent data entry. Data quality begins at data creation. We cannot boil the ocean, but we can make sure all the burners are on. The goal of a comprehensive data management program is to be prepared for new use cases and prioritize the more important projects."

Moreover, the strategic data objectives of a state entity, such as advancing its data and analytics capabilities, are pivotal considerations for prioritization. As state governments strive to become more data-driven, the maturation of their data infrastructure is essential. This includes not only the technical aspects of data management but also the cultivation of a data-centric culture within the organization. Prioritizing data quality for elements that contribute to these strategic objectives allows for the development of sophisticated analytics that can unlock insights, drive innovation and elevate the overall quality of citizen services both digital services and in-person services.

In essence, the prioritization of data quality initiatives should be a deliberate process, informed by the specific needs and ambitions of the state. By identifying and focusing on critical data elements that resonate with broader state priorities and strategic objectives, governments can boost the return on their data quality investments. This targeted approach ensures that the most impactful areas receive the attention they deserve, leading to a more effective and responsive government that is well equipped to meet the challenges of the modern era and position itself for the future.

All that said, to move the culture, our highly valued state employees, toward an awareness of the value of data, state governments must put in place effective data literacy programs. NASCIO has published on this critical element of data management. NASCIO's report *[Data Literacy Within State Government: Building a Knowledgeable Workforce That Knows How to Use Data for Better Decisions](#)* presents the ingredients for an effective data literacy program in state government where every state employee is essentially a data steward. Some states have in place very comprehensive data literacy programs that are evolving and growing their content over time.



In essence, the prioritization of data quality initiatives should be a deliberate process, informed by the specific needs and ambitions of the state.

A woman with dark hair tied back is shown in profile, looking intently at a tablet computer she is holding. The scene is set in a dimly lit office or workspace, with a laptop screen visible in the background. The lighting is soft and focused on the woman and her device. A yellow rectangular border frames the top portion of the image, containing the word 'RECOMMENDATIONS' in white, uppercase letters.

RECOMMENDATIONS

Have data governance and a supporting operating model.

Data quality must be addressed enterprise-wide within state government to avoid silos and independent efforts. A data governance framework supported by a governing board or council and a network of data stewards ensures that data quality is not an afterthought but a key consideration in organizational strategy. This structure provides oversight, sets standards and enforces policies that uphold data quality. It also fosters a culture of accountability and continuous improvement in data management practices, leading to more reliable and actionable data for the organization.

Assess data assets based on impact and value to the state.

With finite resources, data quality use cases should be assessed based on effort and value. Determine priorities based on alignment with broader state strategic initiatives. This also helps to justify use cases and to garner executive support and alignment outside of the IT organization.

Determine data quality requirements based on business drivers.

Data quality becomes more critical as it matures from its raw state to being AI-ready. With the rapidly increasing emphasis on GenAI, data quality is imperative. The integrity of the data must be preserved and enhanced throughout these stages. Remember that data quality is hardest to control in its raw form, especially when dealing with systems that are owned by other agencies.

Set data quality standards at the point of data creation.

Implementing data quality standards at the point of data creation ensures accuracy and consistency from the start, reducing the need for costly corrections later. This proactive approach enhances decision-making and compliance and is a critical component of a data-driven organization's governance strategy.

Select the right tools to streamline data quality.

Increase the efficiency and accuracy of data validation, cleansing and enrichment tasks. Advanced features, such as automation, real-time monitoring and predictive analytics enable a proactive approach, making it easier to identify and resolve data quality issues.

Institute the right data policies for access and security.

Data policies for access and security are essential to protect sensitive information and maintain data quality standards. Granting access to certain data only to authorized users with the appropriate skills, context and rationale helps to promote that it will be used responsibly. Consider migrating toward adaptive authentication that evaluates the level of risk regarding the data resource being accessed, who is requesting access, when the access is requested and for what purpose that access is being requested. This approach goes beyond a simple yes/no regarding access.

Apply robust metadata and data-cataloging capabilities.

Rigorous metadata, data cataloging and data lineage practices provide a clear understanding of the data's origin, transformation and usage. This transparency aids in tracking the data's history, making it easier to identify the root cause of any data quality issues that arise. Metadata should address the criticality of the data and thus help with determining what level of quality is appropriate. States must have in place a well maintained, up to date, data inventory as a starting point for any data quality program.

Provide data literacy training.

Greater data literacy among data practitioners of all skill sets allows individuals to manage data more effectively. This creates a shared sense of accountability and encourages a more data-driven culture, according to [NASCIO's 2024 data literacy report](#). Training should be relevant to an employee's role and delivered in a way that is most effective for that role.

Invest in data engineering capabilities.

Hiring to obtain the expertise and tools necessary to build robust data pipelines helps to ensure the cleanliness, consistency and readiness of data for accurate analysis.



For more information on data management, see NASCIO's resource center.

nascio.org/resource-center/

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North Dakota

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Contributions

Sincere appreciation to all the state CIOs and IT department staff that took the time to complete the NASCIO/EY data quality survey. In particular, we want to thank those that we interviewed for additional insights on emerging technology within their state. Thank you for your service and dedication to the mission of helping your state provide essential services to its residents.



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