

Making the Case for Insight Enabling Analytics

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INSIGHT ENABLING ANALYTICS

State chief information officers (CIOs) put Data Management and Analytics at #6 in their [*Top Ten Strategies, Policy Issues and Management Processes* for 2021](#).

Data analytics also presents as priority #6 on the state chief information officer's *Top Ten Technologies, Applications and Tools*.

These state CIO priorities include business intelligence, business analytics, predictive analytics, strategy, governance, roles and responsibilities. These priorities construct the complete picture for a state government's comprehensive portfolio of capabilities and governance supporting:

- Managing the portfolio of state government data assets;
- Ensuring the safety, security, and integrity of these assets;
- Managing the accessibility and authority regarding who can access these assets;
- Providing the necessary analytical capabilities to exploit these data assets in order to create understanding, necessary alerts, performance of state programs, and insights for decision makers;
- Ensuring through objective evaluation that the analytical tools and analysis used are actually delivering better results;
- Effective application of analytics to evaluate the operations of programs and processes, and the outcomes these programs and processes are intended to deliver;
- Creation of evidence-based policies affecting citizens and residents.

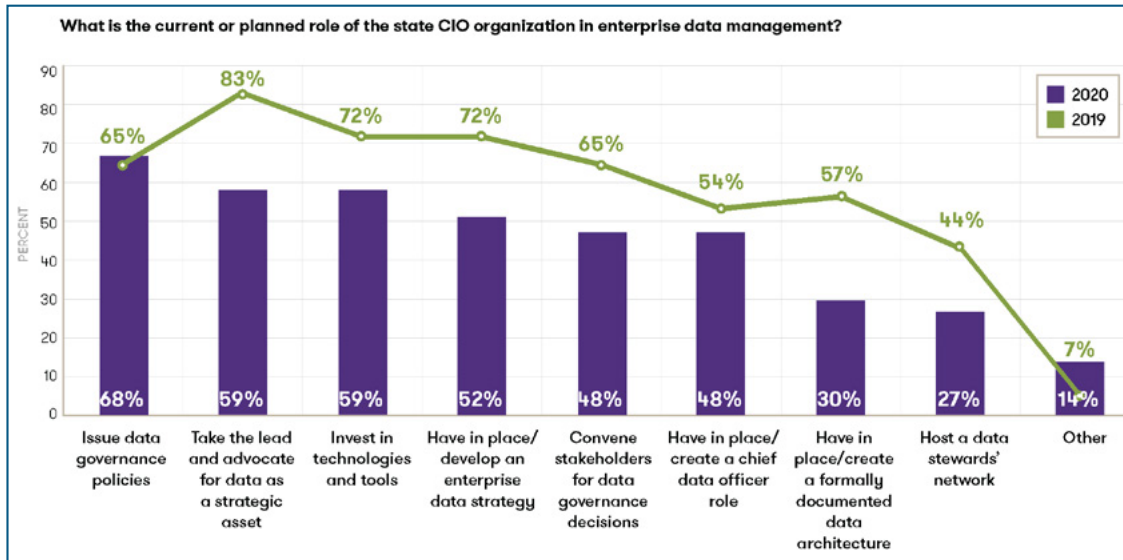
These priorities include tools, but the “toolbox” only supports the *intelligent application* of analysis that will then provide *insights* to decision makers who will make policy decisions that *lead to positive outcomes* for citizens.

As stated in the [2020 State CIO Survey](#), “Increasingly, data management and analytics are playing a central role in decision-making and service delivery for state governments with CIOs often taking the lead. And we anticipate even **more emphasis on necessary insight enabling analytics employed across all state agencies as they formulate their mitigation strategies in light of events like the 2020 pandemic.**”

As presented in the 2020 State CIO Survey, we asked state CIOs about the current or planned role of the state CIO organization in enterprise data management. Sixty-eight percent (68%) of state CIOs chose *issue data governance policies* as their top choice, pushing governance to the top of the list for 2020. In second place priority is a tie between *take the lead and*



advocate for data as a strategic asset and invest in technologies and tools. From both 2019 and 2020 responses, state CIOs told us that another important priority is *have in place / develop an enterprise data strategy*. Clearly these aspects of governance, data strategy and analytics are working together to provide a complete capability for delivering insights.



Enabling Collaboration and Co-Creation

In recent years, the importance of collaboration and co-creation has been highlighted more and more by state CIOs. Teaming with stakeholders is essential to the effective management of data, the application and adoption of insight enabling analytics and the ongoing evaluation of those analytics to ensure they are the *right set of analytics*. This is also supported by the fifth priority from the 2020 State CIO Survey: *Convene stakeholders for data governance decisions*.

In NASCIO's series on insight enabling analytics "[Do You Think or Do You Know.](#)" the most important messaging is the expectation that policy decisions within state government are based on information gleaned from leveraging data assets to improve outcomes for citizens and residents. The state government portfolio of data is enormous. It is critical to effective analytics that we determine what data is actually useful, or most useful, for surfacing insights. Further, these policy decisions will be based on *insight enabling analytics* that present and demonstrate with a *high level of confidence* what the facts are to support any decisions that lead to policy and service improvements.

Importance of Data Classification

The analysis we're describing absolutely depends on *high quality, reliable, timely data resources* that are the input to analytics. This requirement is what precipitates the emphasis on data governance practices, treating

data as a strategic asset and developing an enterprise-wide data strategy. Effective data management including data quality is essential to providing the capability to actually *do effective analysis* intended to provide the insights we're looking for to make the right decisions. Effective data management includes applying the necessary security and privacy protections depending on the classification of the data. Effective data management also includes providing access to data that is based on that classification and the authority or authorization of the requester. We want to make data available to citizens for their use but with the caveat of necessary predetermined data security and privacy, data classification and access authorization.

Enabling Transparency and Accountability

The constituents of state government, citizens, non-profits and corporations, are using analytics in their own decision-making process every day. These constituents will increasingly express a demand for accountability of government leaders and government operations. This growing expectation requires state government to employ data management and analytics to measure the performance of services and to guide the formation of evidence-based policy decisions. Further, the advent of digital government capabilities enables new levels of citizen participation in government. As these capabilities mature, citizens have increasingly more access to state government data and access to the necessary tools and know-how to effectively analyze that data and draw conclusions.

In order to participate fully in today's environment, citizens need to have the ability to understand how to analyze data to reach insights. So, we must first provide necessary transparency so citizens can see what government is doing on their behalf by providing access to data. Then we should provide the necessary tools to enable citizens to analyze the data, develop their own conclusions and open the way for effective discussion and evaluation of what policy makers are doing. This provides for the collaboration and co-creation with citizens and provides the opportunity for feedback on government processes and programs.

Additionally, analytics will be applied to the data, analysis and decision-making process to evaluate whether course corrections or improvements are indicated in that process. That is, how effective is the process for achieving real outcomes? That is the ongoing "self-check" on the process itself which will lead to ongoing incremental improvement of the process.

Analytics – a Foundational Capability

We're also now looking at analytics as a path for enabling another priority from the 2021 State CIO Top Ten Priorities. This includes employing insight enabling analytics in support of the 2021 State CIO Top Ten #5.

Insight enabling analytics will be employed by state government to uncover, prevent and mitigate fraud; determine where to make budget cuts; determine where to invest; understand how to manage the investments in technology; decide how to manage investments in people; evaluate how to develop and



continually attenuate a government capability in economic resiliency; and determine how to best apply resources including funding.

Why Analytics?

Big data, the Internet of Things, artificial intelligence, machine learning, deep learning – are all hot topics of the day. The question is how to make analytics work for government organizations – how to change the status quo of today’s operational, management and policy decisions to a *data-driven environment* that enables unprecedented outcomes for delivering effective government services. And the real goal is positive outcomes for our citizens, residents and businesses, in our states and territories.

The private sector leverages analytics to enhance market share, improve revenues and reduce costs in an effort to grow profits and ensure competitive longevity. State government uses analytics to gain efficiencies and effectiveness. But, more importantly, to ensure that decision makers have the facts and are not guessing when making policy decisions.

Why Analytics	
Improved Citizen Outcomes	Improved Government Operations
Public Safety	Process Improvements
Public Health	Insight Enabled Decisions
Education	Effective Use of Resources
Economics	Managing Investments
	Assignment of Personnel
	Where to Direct Resources

Applications of analytics currently seen across states include:

- Cybersecurity
- Event analysis
- Predictive analysis
- Identity management heuristics

As states continue to evolve and mature their capabilities, they are also surfacing new applications of analytics. Eventually, we can expect analytics to be employed at all levels of government as more and more government organizations become aware and capable in employing analytics for decision making.

Where Analytics Can Provide Insights

Government has a different mission from industry and that is to optimize the stewardship of taxpayer dollars and to ensure the opportunity for safe, healthy, educated and economically stable lives. So how does government enabling analytics meet these objectives?



- **Reporting analysis = What is happening?** Reporting analysis helps state government understand trends, measurements and outcomes from past behavior. It allows government to report on what happened and what is currently happening, how much occurred and how did we perform? Historic analysis is static and retrospective, so it must be repeated periodically to remain relevant. It is often limited in that it provides measurement of outcomes without the understanding of *why the outcomes occurred*. This type of analysis helps government report activity, compliance and results for key programs, regulations and financial status. Examples include assessing education performance for school and university systems, annual financial reporting and reporting metrics for a social service program. This is a very necessary analysis, *but, it is only one of the necessary applications of insight enabling analytics.*
- **Who is it impacting?** It is necessary for state government to understand what segments of the population, business, communities, jurisdictions and/or geographies are being impacted by an event, a natural disaster or an economic change. This includes *where* are the effects, *who* is most at risk, and *what* outcomes are occurring. This knowledge will help inform decision makers on *how* to direct resources, *when* to deploy them, to *who* and to *where*.
- **Operational analysis = Where is the problem? Why is this happening?** Operational analysis enhances state government's understanding and business decisions by continuous monitoring and re-evaluation of data. It can check business rules, evaluate data patterns and alert to changing dynamics, detect anomalies in data and begin to build insights into why certain outcomes are occurring. This type of analysis helps improve day-to-day decisions helping optimize transaction processing, ensuring optimization and prioritization of processes based on the most up-to-date data available and enables proactive, timely action to quickly changing situations. This knowledge can also feed into *predictive analytics*. If we know *why* something is happening, *what* circumstances are in place for certain events to occur, then we can potentially *predict* within some confidence intervals *what will happen in the future*.

Examples may include prioritizing fraud and compliance investigations, realigning public safety resources based on changing crime incidents, or pausing financial payments pending audit and review. For example, if we know what environmental factors either encourage or discourage crime, then we can work toward safer communities, safer streets and reducing incidents.

- **Predictive analysis = What will happen next?** Predictive analysis facilitates state government's ability to take the knowledge and understanding of past data, actions and related past outcomes, and begin to take action now to affect future outcomes. Predictive analysis helps us understand why things happened and what factors we may want to consider to change future results. It provides the opportunity to ask "what if?" to



understand the likely outcomes of action and to determine how to achieve the best possible outcomes in the future. These types of analytic models must continually “learn” and adjust over time to continually gain more and more precision.

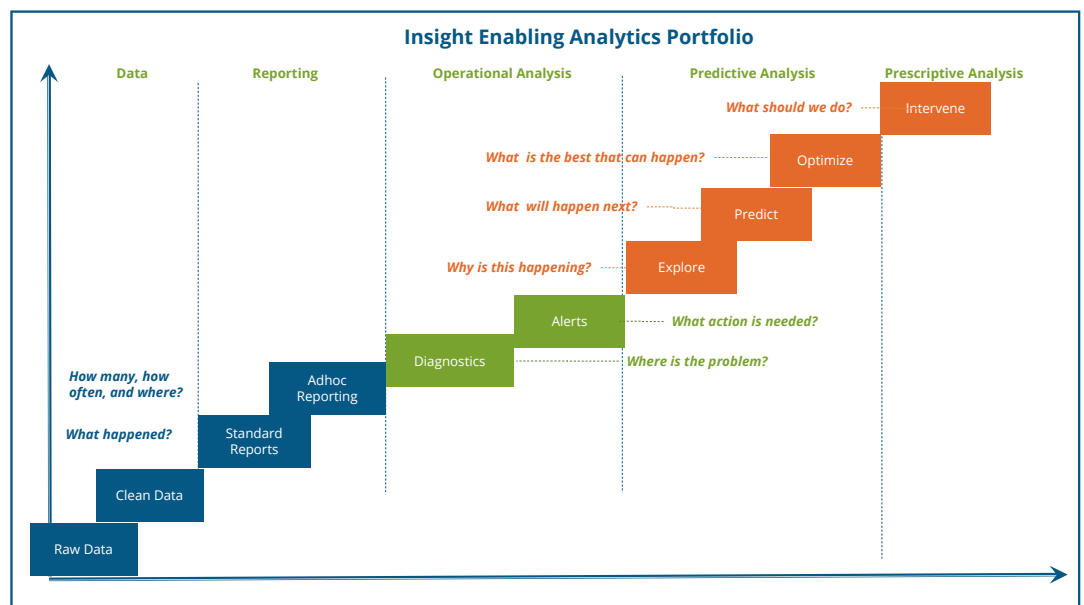
- **Prescriptive analysis = What should we do next? How can we make effective changes?** Prescriptive analysis provides a platform for exploring. Based on operational and predictive analysis, various scenarios can be run to explore potential outcomes and experiment to see what the primary, secondary and tertiary effects *might be*. Those effects will necessarily have *associated probabilities and confidence intervals* that present the *potential for risk and reward*.

As we go forward in time, the number of dimensions that *prescriptive* and *predictive* analytics employ grows immensely, thus the need for advanced capabilities that can manage *n dimensions and factors*. These models will always be experimental in nature and will continue to “learn,” adapt and adjust as the capability for advanced analytics grows. Further, *predictive* and *prescriptive* analytics will benefit immensely from multi-state collaboration where states compare models and learn from each other. That kind of activity will move everyone up the maturity curve with continual learning.

The Analytics Portfolio

Many government organizations think of analytics as data collection and reporting. In reality, much of the current efforts around data and reporting are static, retrospective and dated as soon as they are published. As states move beyond these current efforts, the analytics portfolio expands. The following presents a portfolio of analytics capabilities that state government will eventually need to develop and manage.

This diagram presents a progression in the degree of intelligence required and degree of government transformation. This progression does not mean that the different types of analytics reflect a maturity in an analytics program. All these applications of analytics remain important components of the *complete analytical toolbox* and should be expected to expand over time. We'll always have standard reports. We will always try to establish what happened and why. As well, as we gain additional kinds of predictive modeling capabilities and learn to use them effectively, we will be asking “what is the best that can happen?”



Questions, Questions, Questions . . Oh My!

As an example of applying these types of analytics, let's consider any event whether it is related to public health, utilities such as water and electric, cybersecurity, finance, human resources or project and portfolio management.

Proper application of analytics can help uncover what actually happened and these questions should be considered:

- Who was involved?
- Who is affected?
- What is the actual threat?
- What is the actual opportunity?
- What are effective methods for assessing and monitoring the threat or opportunity?
- What confidence can we place on any of these methods?
- What risks exist?
- What is the likelihood and magnitude of these risks?
- What mitigation can be carried out to eliminate or reduce the risk?
- What additional risks arrive with mitigation strategies?
- What populations are at risk?
- What economic sectors are at risk?
- What opportunity risk exists? (i.e., if we invest in this, what are we not investing in?)
- What exactly is that risk?
- What learnings surfaced through the lifecycle of the threat or opportunity?
- What needs to change?
- How do we create a resiliency for future events?
- What are the ripple effects related to an event or opportunity and the responses to it?
- What is the efficacy of our choices?
- What are the risk factors related to the underlying cause and actions?
- What is the economic/human/environmental/market impact?
- What are effective economic interventions such as funding?
- What are the best targets of investment of these funds?
- What possible scenarios can be expected to play out in a crisis?
- What are probabilities and magnitude of those scenarios?
- What was lacking in our economic strategies that put businesses, families and government at economic risk?
- How do we restore businesses, families and government?
- What predictive methods could be employed to anticipate the lifecycle of an event and recovery from an event?

A lot of questions, right?



And this isn't even half the questions we should be asking. Analytics starts with issues which leads to questions; those questions precipitate analysis; and that analysis feeds into the solution space. Given what we know about a threat, opportunity and evolving issues, what can we do about it? And if we pursue any particular response – what is the efficacy of that response and how might it play out over the short run, medium term, and long term?

Going forward with increasingly broad types of data, including big data, unstructured data, streaming data and new analytic capabilities that employ artificial intelligence, machine learning and deep learning, government is primed for even greater capabilities of analysis, greater insights into business decisions and increased optimization to reach desired outcomes.

Getting Started

Over time what we're aiming for in state government is a ubiquitous approach to analytics. No longer reserved for the mathematical rock stars – we want to enhance everyone's role with the necessary know how, and motivation, to ask questions, interrogate reality, ask "why?" and "why not?" and pursue an attitude that is always exploring, always experimenting, always asking, and always learning.

All this activity is motivated by the main reason we're here – to serve our citizens and our residents and to continually do better and better at that mission. Thus, we are moving into an *ecosystem of rationale*, where in some cases we are providing evidence to others to support decisions and evidence-based policies with both data and analytics. Anticipate more requests from staff and citizens such as, "show me your data"; "show me your analysis of that data"; and "show me your conclusions."

This *ecosystem* is a foundation for creating an environment based on objective reasoning which removes or reduces other motivations, agendas and bias. What results are facts versus opinions? As the title of our analytics series reads, "Do You Think or Do You Know?" We're not interested in opinions only. We want facts and then we want to have open discussion of those facts.

Creating an analytics ecosystem is about more than a single technology, solution or platform – it requires *creating a culture* that asks questions and uses data more effectively by:

- Modeling a commitment to the value of data and insight enabling analytics in the decision-making process.
- Establishing a strategic approach to collaboration and turning data into information that drives action.
- Implementing a strong data governance practice.
- Strategically investing at the enterprise level.
- Embedding analysis into everyday business processes and everyone's role.
- Evolving from static reports and basic visualizations to also include forecasting, optimization, predicting and prescriptive simulations.
- Demonstrating business value through transformation of information into intelligence that drives better business outcomes for citizens and residents.



- Integrating data across the enterprise for new intelligence.
- Establishing effective governance. Governance will determine who has a seat at the table. As states mature their analytical portfolio of capabilities the number of participants can be expected to grow.

The Four Forces

As presented in NASCIO's publication, [The State CIO Operating Model: Leveraging the Power of the Four Forces](#), there are four forces putting demands, issues and influence on the office of the state CIO. These have been categorized as market forces, customer forces, political forces and inertial forces. The four forces work in both directions: they influence the state CIO's agenda and they impact the decisions reached in implementing strategic intent. The state CIO's response to these forces essentially are the priorities that surface on each state CIO's agenda. The state CIO's leverage of any particular force will depend on the circumstances and specific goals of the executive.

The compilation of these priority responses from across all the states and territories is what comprises the [NASCIO State CIO Top Ten](#). This annual compilation represents to all the states and to the marketplace the highest priority actions being undertaken by state CIOs. Each of these "Top Ten" priority actions will in fact leverage one or more of the four forces. Most often any particular action will leverage multiple forces for government change and most likely will have aspects from all four of the forces.

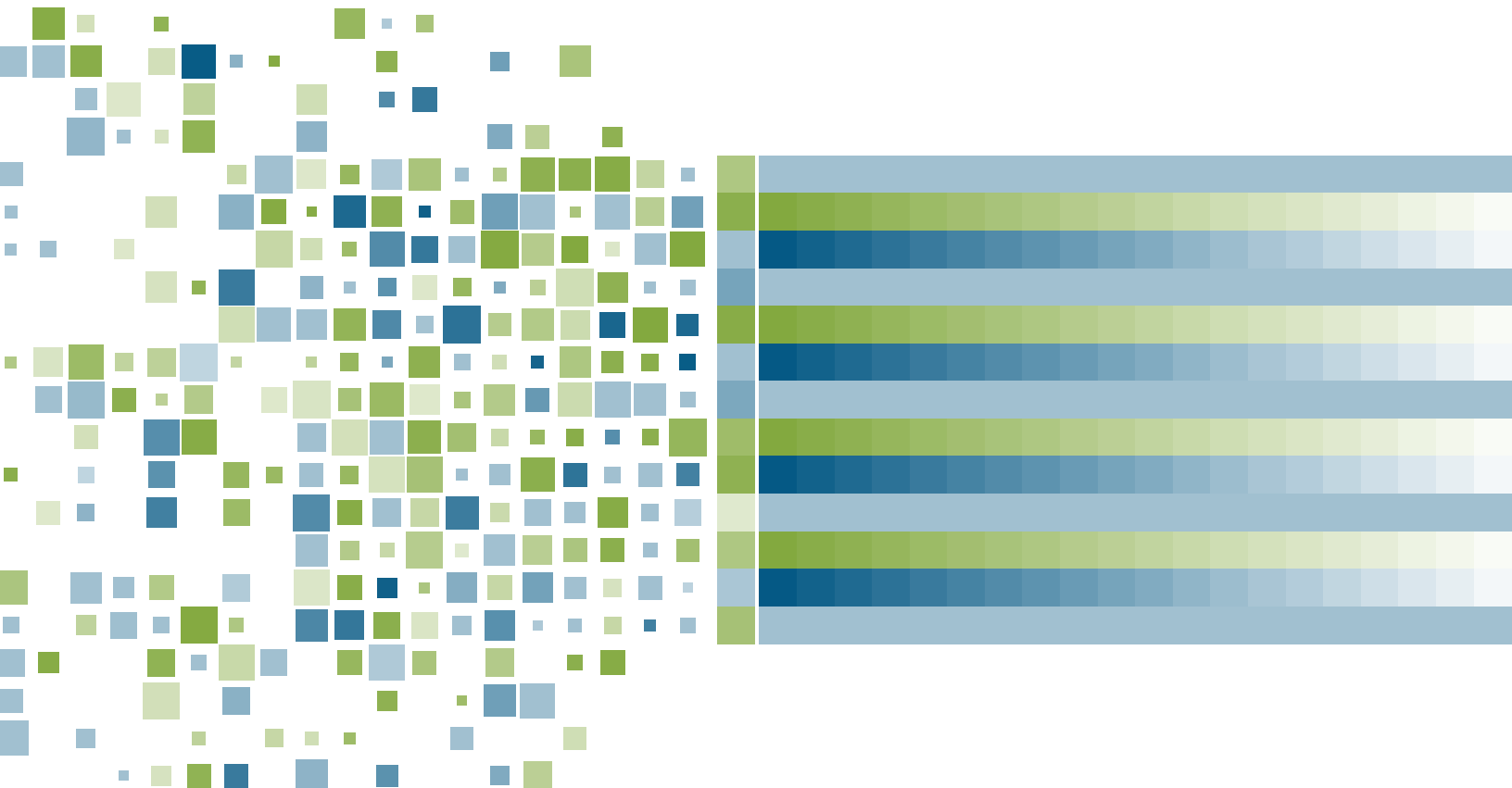
Recommended Actions

In evaluating each of the recommended actions presented here consideration should be given to how to leverage each of the four forces, when to leverage a particular force and which force(s) may be of a higher priority for a given recommended action.

- First, determine your philosophical approach to analytics. Will this management initiative be a centralized, enterprise-wide function, or will it be a federated organization?
- Determine how the analytics function should be positioned to most effectively fulfill its intended function. Consider human capital, organizational culture, knowledge assets and the Four Forces in placing the function organizationally. The applicability of these various factors is determined by the particular circumstances to which they are applied.
- Determine the source for necessary capabilities such as internal, through cross-jurisdictional collaborative arrangements and/or via industry partners.
- Focus on two important goals for acting on the results of any insights. First, the best answer wins – this removes any personal bias. Secondly, think citizen first – this keeps our primary objective in front of us – citizen outcomes.
- Look at success stories across state government and industry - and emulate what works regarding best practices and shared services. Optimize and leverage best of breed.
- Early initiatives should focus on quick wins showing the effectiveness and importance of analytics.
- Partner with the state chief data officer to establish appropriate analytics governance, operating discipline and training.



- Apply Lean discipline to existing processes to make necessary incremental improvements based on supporting analysis.
- Evaluate services to determine which services should be commoditized and which should be centralized.
- Consider establishing a center of excellence for promoting analytics, providing learning, providing consulting and providing technology transfer.
- Additional applications should address how to create an outstanding customer experience and financial success and not get distracted by the latest “shiny object.”
- For each of the above recommendations:
 - Review analytics with meaningful metrics to judge/evaluate effectiveness of capabilities. Include all stakeholders.
 - Apply effective analytics in evaluating and managing the state information technology (IT) investment to determine where to cut and where to invest.
 - Apply effective analytics, and modeling techniques, to support decision making regarding funding such as funding to states under the American Rescue Plan Act of 2021.



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