

Introduction

Emerging technologies will fuel a fundamental transformation of government. They will also introduce new risks.

Consultants, technology firms and analysts love to produce annual laundry lists of technology trends that will change the world, usually with “flying car” glimpses of a magical new future. This chapter takes a different tack by offering an agenda that’s designed to help state governments solve their most pressing policy and operational challenges.

The technology trends we examine are clustered in two categories: emerging enablers and disruptive technologies.

Emerging enablers are core disciplines that have evolved within organizations — capabilities, skills and philosophies that are critical for partnering, innovating and creating more value. These include enterprisewide IT consolidation, server virtualization and cybersecurity. Though some have already been addressed at length by state governments, they

deserve a reevaluation by governors and CIOs based on evolving technologies and work environments. This chapter examines two of these in more detail: IT consolidation and cybersecurity.

Disruptive technologies are trends that present significant new opportunities for improving how government operates and delivers services. Disruptive technologies include cloud computing, mobile computing, machine learning, deep data analytics and social media, which will be covered in chapter 8. Individually, these technologies may not be disruptive; but deployed together they may positively disrupt the cost, capabilities or even the core operating model of IT and the deployment of services. In this chapter, we examine two of these disruptive technologies in more depth: cloud computing and data analytics.

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“CIOs should be thinking in terms of how to transform the operations of government and how to extract redundancies from today’s broken, out-of-date, 1950s-era model.”

~ GOPAL KHANNA, CIO, STATE OF MINNESOTA

For state governments, when deployed effectively, these emerging enablers and disruptive technologies can simplify non-essential critical tasks through automation and transform the very business of government. Technology solutions are often expensive, however, and the laundry list of failed state IT projects would deter executives in any industry from allocating scarce dollars. However, state agencies that successfully harness information technology’s potential to reduce cost and improve service delivery have demonstrated the value of thoughtful, purposeful adoption of new technology.

Two-thirds of CIOs expect lower IT budgets through 2013.⁷⁹

There is no shortage of challenges ahead for governors and their state CIOs. Technology introductions invariably disrupt the status quo and therefore must be managed with great care. Not only will they change the way state governments operate, but they also present new dangers, particularly in terms of how we safeguard data and handle the constant threat of cyberattacks. Though there are many hurdles ahead, sitting on the sidelines is not an option. State governments must carefully navigate this changing terrain, making smart investments in technology solutions.

7-1. Emerging enablers and disruptive technologies

Emerging enablers	Disruptive technologies
IT consolidation	Cloud computing
Virtualization	Machine learning
Cybersecurity	Mobile computing
Enterprise information management	Deep data analytics
IT governance	Social media

Source: Deloitte Research

Cutting fat through IT consolidation

Taking the costs out of information technology

IT consolidation has risen to the top of most state CIOs' agendas.⁸⁰ The impetus behind consolidation is clear: the piecemeal development of many states' IT infrastructures has inadvertently created an inefficient and duplicative web of systems that don't communicate with one another. This evolution has been aggravated by a historically fragmented priority- and budget-setting process at state and federal levels around IT and has further divided siloed state IT shops. As more and more citizen data are kept in digital form, the need for IT transformation and consolidation is even more compelling.

In 2009, state CIOs listed consolidation as their #2 priority, after budget control.⁸¹

Without consistent IT standards, protocols, systems and coordinated approaches to investments in IT, states will be stuck devoting scarce time and resources to fixing legacy systems and searching for data, rather than administering programs or introducing innovation into their services. Even more discouraging, two-thirds of public sector CIOs expect further budget reductions for IT due to the recent economic downturn, only enhancing the case for timely IT consolidation.⁸²

ACTION PLAN FOR CONSOLIDATING IT

With nearly all states having taken on some form of consolidation activity, clear lessons have emerged in how to successfully execute this transformation:

Customize your approach

Successful state consolidations vary greatly. Approaches include total centralization, federation, hybrid models and outsourcing. Some states have conducted their consolidations piecemeal over time; others took more of a "big bang" approach to implementation.

Georgia opted for a big bang approach. The state determined that it could most effectively provide consolidated IT services by outsourcing them. Georgia selected one organization to manage infrastructure and associated services, and a second for network and telecom services. The state technology authority, which focuses on service delivery and quality, maintains governance and oversight of IT services. Thirteen departments were consolidated, and staff was reduced by more than 70 percent. The \$203 million in savings from consolidation (over eight years) also enabled the state to modernize its IT assets.

Massachusetts took a very different approach. The state's federated consolidation model balances gains from economies of scale with the business

needs of individual state departments. This model designated a CIO for each of the executive departments and developed coordinated cycles for strategic planning and sharing of common needs and best practices. Massachusetts implemented consolidation without making significant layoffs or reducing current levels of service.

Address where you are *and* where you'd like to go

Take time for both high-level and detailed consolidation planning, focused on both immediate and future needs. A forward-thinking consolidation roadmap can enable advanced planning for technology changes, growing populations, emerging citizen needs and service-improvement opportunities. It can also make the plan “administration proof” and keep it from being merely the policy program du jour.

Examine the opportunities to consolidate systems

Illinois, too, has gone the infrastructure route, consolidating servers into two primary data centers, with an ROI since 2006 of some \$11 million. But the state has also focused on revamping its application development and management. A study by the University of Chicago found that 25 percent of the families served by the state’s various health and human services agencies represented about 85 percent of program usage. “What that told us was that on the IT side, we needed to focus on commonalities across programs,” says Greg Wass, the state’s CIO. “They all have an application intake process; they all have an eligibility layer; they all have some kind of casework or case management layer.”⁸³ So over the past two years, the state has launched an effort to turn its program silos into what Wass calls “service horizontals.” The idea is to build IT services — beginning with a single client ID service, an eligibility rules engine, and a provider management system — to be used by all subscribing state agencies.

What works: Michigan’s IT consolidation

Michigan was one of the first states to go down the consolidation path. With the strong support of then-governor Jennifer Granholm, the state consolidated 19 agencies, reduced 40 data centers to 3, and reduced staff by nearly 15 percent when nearly all state IT functions were reassigned from various departments to the state’s central IT organization. This model created a single source of authority and integrated strategic planning. Consolidated operations have resulted in an estimated \$100 million in savings for the state. “We had a clear vision that a consolidated computing environment was the right choice,” says Granholm.

Illinois is working with four other states and the federal government to take the connected services technology concept to the next level — across states. Minnesota, Oregon, Utah and West Virginia are collaborating with Illinois to obtain a federal innovation grant to develop a service that can be shared among multiple states. The START project (Strategy to Apply Reusable Technology) could dramatically change the way some large state technology programs, particularly health and human services, are planned, developed, funded and managed in the future. Current federal spending on 50 state health and human services systems exceeds \$11 billion annually. While technology to support these programs has improved greatly in recent

years — from paper to mainframe to client-server to Web-based platforms — the underlying architecture of “one program, one system” has remained frozen in time. The potential for service improvements to clients and cost savings for state governments from a service-oriented approach is tremendous.

Gather wide participation

An effective consolidation will consider how to actively engage a wide range of stakeholders, as well as how to consolidate infrastructure and assets. In Massachusetts, for example, many agencies balked at a plan to move all state government data to secure managed storage, since their current, informal



management processes cost them nothing from an ongoing budget perspective. To persuade those agencies to participate in this seemingly cost-prohibitive change, the state’s Information Technology Division devised a medium-term chargeback structure, bringing infrastructure into a secure state while also meeting participants’ cost constraints.

Don’t underestimate the human resources factor

IT consolidation is as much about the movement of human resources and financial assets as it is about the convergence of desktops, servers and systems. Thus, even if the consolidation plan involves no outsourcing or layoffs, human resource issues will be critical. Understanding the capacity, roles and responsibilities of IT staff, and building that into the consolidation plan, will help ease the challenges of organizational design and change later on. Communicating transparently and regularly with staff can limit confusion and rumors and increase support for a new program.

Roadblocks to overcome

People transition issues

Consolidation will likely change the number of jobs and types of activities conducted by IT staff, potentially creating resistance and confusion. Additionally, states possess many legacy systems and programs that require special skills held by specific employees. Maintaining the right institutional knowledge over assets can prove challenging in a consolidation.

Inventorying IT assets

Inventorying IT assets is a complex, time-consuming project, especially if states do not have strong asset management practices in place. States often lack enterprisewide insights into what IT assets they have, where they reside and how they are maintained, providing another challenge to successful consolidation. Tools exist however to automatically scan and maintain IT asset inventories.

Transition and replacement costs

Many crucial state technology assets reside in poorly managed server closets or under desks, with few information security protocols. Replacing, re-engineering or virtualizing these resources may require costly investments in technology, resources, facilities and time.

What works: Minnesota’s e-licensing consolidation

Minnesota’s e-licensing portal allows citizens and businesses to apply for, renew and manage licenses with 22 state agencies and boards. Previously, agencies and boards used more than 60 separate licensing systems. These increased the complexity of the licensing process and were costly to maintain. Also, aging systems posed a risk of system failure.

Implemented in phases, the Minnesota Electronic Licensing System (MNELS) includes a single customer-facing e-licensing solution that allows citizens and businesses to log into one online system to manage all professional and business licenses. Standardizing licensing transactions makes it easier for customers to do business in and with the state, along with improving regulatory and enforcement capability for state agencies and boards.

Cybersecurity

Making cybersecurity a priority before your state becomes a target

People put a lot of trust in state governments to collect, maintain and protect the appropriate information necessary to execute their programs, protect individual rights and ensure public safety. The volume of that information expands at an ever-increasing pace, and maintenance and protection of that information, particularly where it involves personally identifiable information (PII) and personal health information (PHI), becomes more and more challenging. It is especially challenging when privacy needs to be balanced with freedom-of-information mandates and online government access.

State agencies possess treasure troves of medical, financial and other personally identifiable information, not to mention sensitive business data and information relevant to national security. In fact, states likely have more citizen data than any other level of government. This information is under direct and focused attack. A scan of public data-loss notification Web sites indicates that more

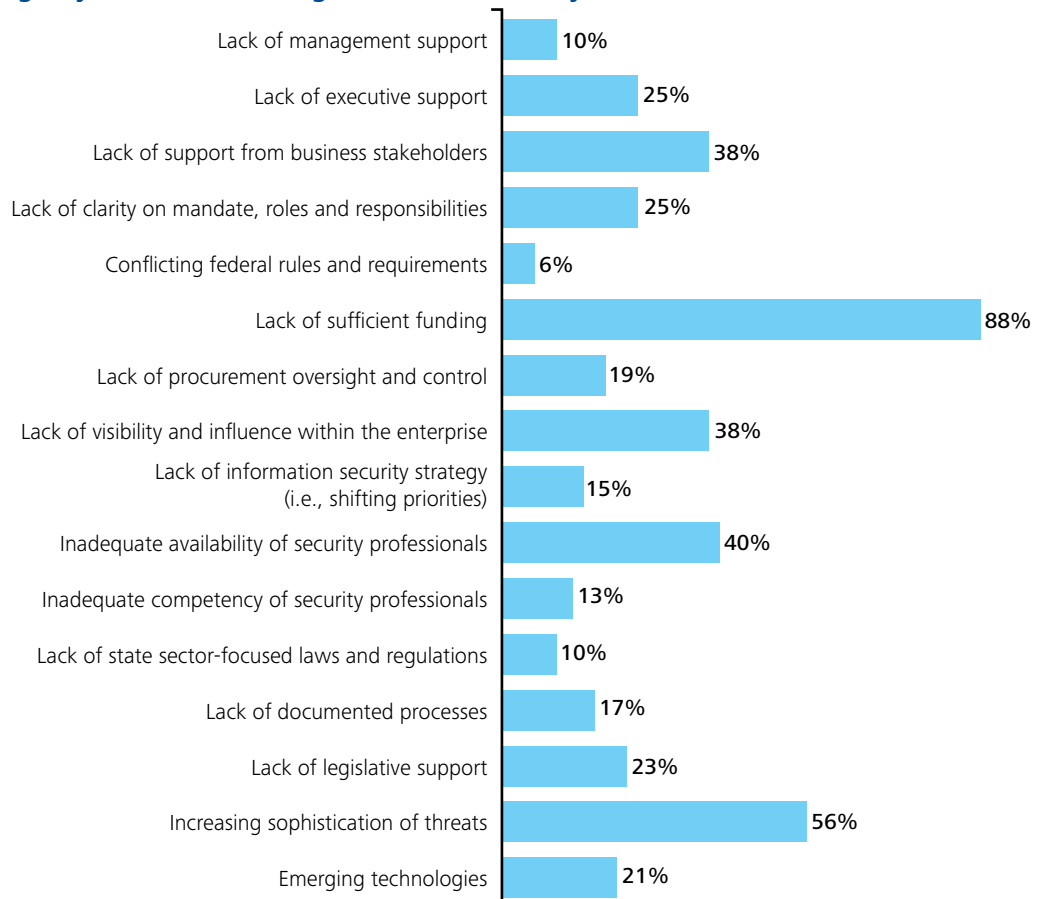
than one-fifth of reported data breaches in 2009 occurred in the state and local government sectors.

Cyberthreats are increasing in sophistication and force. The threat of participation of some foreign governments and organized crime has added another element to the array of cyber risks; potential traps for sensitive consumer information are multiplying.

Security researchers now uncover nearly 100,000 new malware samples each day.⁸⁴

While states have established chief information security officer (CISO) positions over the last decade and worked hard to secure state-maintained networks and systems, the ever-increasing number and nature of threats have created an evolving landscape in which vulnerabilities continue to threaten the security of state government. State and local governments, federal agencies and the private sector must work together to implement tougher security safeguards, thwart these threats and be ready to respond when an attack occurs.

7-2. What major barriers does your state (or agency) face in addressing information security



Source : NASCIO-Deloitte report, *State Governments at Risk*

Approach cybersecurity as the ongoing management of a continuous risk, not as a safeguard against specific future attacks.

ACTION PLAN FOR ENHANCING STATE CYBERSECURITY

To keep up with today's ever-increasing cyberthreats, states must step up their actions. These strategies should form the foundation of a cybersecurity gameplan:

Establish standards

Although there is no mandated state compliance platform to drive consistent security programs, adopting an understood, comprehensive and repeatable framework statewide will enable improved alignment between state agencies and business, technology and security leaders.

Make security a priority for everyone

Governors should follow the lead of the federal government and private industry when it comes to making information security a priority. First, the role of CISO should be elevated to have enterprise-level authority. Second, the CISOs should seek out the support of leadership across all branches of government, as well as influencers and other private-public stakeholders, to

advance the discussions. Lastly, joining forces with attorneys general, homeland security and federal and local agencies may help raise the bar for information protection in state government.

In 2009, Michigan became the first state to announce that it would deploy the network monitoring system EINSTEIN 1, which is operated by the U.S. Department of Homeland Security. As part of the collaboration, DHS's U.S. Computer Emergency Readiness Team (US-CERT) will provide services to Michigan, identifying suspicious activity on state networks and addressing threats.⁸⁵

Catalog all potential sources of threat

Identify key assets and likely threats; then, focus security resources accordingly. Unintentional or malicious acts from inside an organization are just as potentially dangerous as external breaches. Biometrics and smart cards can help improve internal security through stronger authentication measures and preauthorization of critical transactions.

States also need to monitor and assess security capabilities of third-party providers. State agencies rely heavily on the services and data-sharing capabilities of third-party service providers, contractors,

7-3. Level of confidence in protecting information assets from threats

Using a scale from 0-5 indicate your level of confidence that your organization's information assets are protected from threats	Not confident at all	Not very confident	Somewhat confident	Very confident	Extremely confident	Not applicable/ Do not know
Attacks originating internally	6%	19%	57%	11%	2%	4%
Attacks originating externally	4%	13%	45%	26%	9%	4%

Source: NASCIO-Deloitte report, *State Governments at Risk*

business partners and community organizations. Many of these third parties manage their own networks, receive delegated user management capabilities for state-run systems, and have access to sensitive information and equipment of state agencies. Solutions must involve not just technical tools, but also process improvement, fail-safe protection and training and awareness programs.

Coordinate across the state enterprise

Business and security must be better aligned from strategy through to execution. This makes it critical for the CISOs to fulfill their enterprisewide risk management role. Regular reporting and metrics are key parts of achieving this alignment.

Arkansas is one of several states that have created offices to coordinate cybersecurity activities across the entire state enterprise. The Arkansas Cyber Security Office establishes standards and policies for securing the state government's information technology resources. It also coordinates resources used to protect multiple state government organizations, including the Arkansas Continuity of Operations Program.

Roadblocks to overcome

Governance and funding
 State CISOs lack the funding, programs, resources and tools available to CISOs of comparable federal agencies and private sector enterprises. More significant, most state CISOs lack the enterprise authority to manage the risks that threaten critical information assets spread across multiple agencies, departments, boards and other organizations that make up state government.

Internal threats
 States traditionally have focused on strengthening the perimeters of their networks to keep cybercriminals out. State CIOs generally express less confidence in their ability to prevent internal threats when compared to external threats (see figure 7-3). Many internal breaches are the result of accidental breach of information, such as the accidental loss of an unencrypted laptop or hard drive. Others can be traced to the malicious behavior of employees.

Cloud computing

Making the transition to on-demand computing

Today, anyone with an Amazon.com account can rent nearly unlimited computing capacity and storage on Amazon's Web Services platform. No contracts are needed, and procurement is as simple as buying a book. Popular services such as Gmail and Flickr operate in much the same manner. Information is stored centrally on the Web, where it is accessible from any machine. This computing model is called cloud computing.

It's hard to recall a recent technological development that has generated more hype and expectations than cloud computing. Why all the excitement? It's an idea with a clear value proposition to drive customer demand. The convergence of standardized Internet technologies, virtualization and automation of large-scale data centers has created a set of software services that were unthinkable even a few years ago. The qualities that define cloud computing — on-demand service, elastic capacity and variable consumption — represent a powerful new way to deliver IT services.

Cloud computing represents a fundamentally different way for government to architect and remotely manage computing resources. It allows CIOs to leverage powerful IT infrastructures in a fraction of the time it takes to provision, develop and deploy similar assets in-house. The cloud eliminates barriers, opening up nearly unlimited computing

resources at superior economies of scale. It can also create strategic, transformational and even revolutionary benefits beyond the immediate and pragmatic opportunities to improve efficiency.

These benefits led cost-conscious policymakers to recognize cloud computing as an attractive new form of low-cost IT outsourcing. If executed thoughtfully, the budget savings are considerable. Adopting cloud technologies eliminates capital and operational expenses associated with servers, software licenses, maintenance fees, data center space and the employment of IT labor. Furthermore, cloud computing permits greater flexibility and speed and the capacity to add and subtract computer power as needed. Cost pressures have led cloud computing to gain greater traction.

Cloud computing is evolving at a brisk pace. Looking ahead, a series of significant disruptions will likely emerge. These disruptions will be progressively more widespread and profound, creating opportunities to reshape not only the technology industry, but all institutional architectures and management practices in an expanding array of industries, including state government.

7-4. Types of cloud models

Vendor cloud (External)	Cloud computing services from vendors that can be accessed across the Internet or a private network, using one or more data centers, shared among multiple customers, with varying degrees of data privacy control. Sometimes called “public” cloud computing.
Private cloud (Internal)	Computing architectures modeled after vendor clouds, yet built, managed, and used internally by an enterprise; uses a shared services model with variable usage of a common pool of virtualized computing resources. Data is controlled within the enterprise.
Hybrid cloud	A mix of vendor cloud services, internal cloud computing architectures and classic IT infrastructure, forming a hybrid model that uses the best-of-breed technologies to meet specific needs.
Community cloud	Used across organizations that have similar objectives and concerns, allowing for shared infrastructure and services. Can be deployed using any of the three methods outlined above, simplifying cross-functional IT governance.

Source: Deloitte

ACTION PLAN FOR TRANSITIONING TO CLOUD COMPUTING

The transition to cloud computing represents a fundamental shift in how states provide IT. It will not happen overnight. A thoughtful, staged approach would consist of the following four steps:

Develop a cloud strategy tailored to your state

Cloud computing is not a one-size-fits-all solution. You need to tailor it to your specific environment in order to garner the greatest benefit to your government organization. Through a hybrid approach, the State of Utah is saving \$4 million a year in hosting services by consolidating data centers, virtualizing servers and moving to a private cloud platform. Eventually, Utah’s hybrid private cloud will deliver hosted email and Web applications to cities and counties within the state.

To ensure that cloud computing adds genuine value requires thoughtfulness about selecting the right opportunities and seeking

a clear return on investment based on actual usage, not simply anticipated savings.

Start small with non-mission-critical applications

Develop a business case for a simple pilot project — preferably supporting a new, non-essential application — and follow it closely. Plan, measure and evaluate costs and benefits before, during and after implementation. Ensure that the state information technology shop understands and becomes comfortable with cloud computing before proceeding to more central, operational applications.

Gradually expand utilization of cloud computing

Once a state successfully deploys cloud computing technologies, it is time to expand to more strategic government services. This entails being more conscious of the implications of cloud computing on employee workflow and business processes. Cloud computing is an enabling technology — deploying it to central services of the government requires being conscious from the start about how that will change the way your state does things.

What works: Oregon’s partnership with Google

Oregon will save an estimated \$1.5 million annually by partnering with Google to offer the state’s schools cloud-based computing. The initiative provides Oregon’s public schools the ability to transition email, calendars, online documents, video conferencing and Web site creation to Google’s Apps for Education services.⁸⁶

Bring other government entities into the cloud

The big benefits from cloud computing will come from numerous state, higher education and local entities all sharing a common computing platform. "Eventually, there is no reason to believe we shouldn't have a common cloud platform for unemployment insurance, Medicaid and other large systems that serve multiple jurisdictions," says Gopal Khanna, the CIO of Minnesota.

The Ohio Academic Resource Network (OARnet), the technology arm of the University System of Ohio, is developing a common technology platform for itself and four other organizations involved with higher education in the state. The facility will

include networked storage, virtualized servers, clustered applications and a consolidated storage area network. OARnet also will provide a common infrastructure for delivering cloud computing services to research institutions and institutions of higher education in Ohio.⁸⁷ Eventually this platform could be shared across states with other universities.

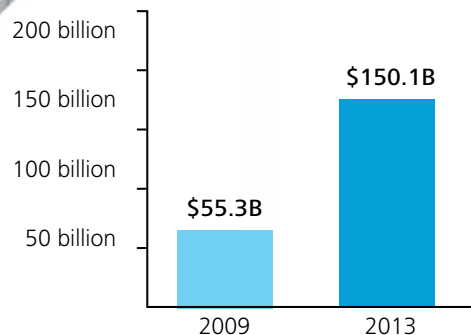
Next door, the State of Michigan plans to build a data center that will provide cloud computing services to state agencies as well as cities, counties and schools. The state will also use the new center to spur economic development by offering application hosting and data storage to private sector businesses.⁸⁸

Top threats to cloud computing

- Abuse and nefarious use of cloud computing
- Insecure application programming interfaces
 - Malicious insiders
- Shared technology vulnerabilities
 - Data loss/leakage
- Account, service & traffic hijacking

Source: Cloud Security Alliance

7-5. Projected growth in cloud computing services revenues



Source: Gartner <<http://www.processor.com/editorial/article.asp?article=articles/P3201/23p01/23p01.asp&guid=>

The promise of data analytics

Building the intelligent state enterprise

Data analytics has the potential to transform how government operates. Governments, companies and individuals, with nearly unlimited storage space, are capturing unprecedented amounts of data, which can hold immense value. Today, leading public and private organizations have overcome the tendency to make critical decisions with incomplete information. Instead, they are using analytics tools that go way beyond spreadsheets and basic reporting to mine the terabytes of data they collect to predict customer behavior, forecast events, make better public policy, predict where crime may occur and create new sources of value.

At the same time, the relationship between state governments and citizens is undergoing fundamental change. State leaders recognize that unlocking public data can fuel new levels of performance. In many jurisdictions, data is now viewed as a public asset to be leveraged by citizens, business and communities to inform decisions that can greatly enhance the operational effectiveness of government. Indeed, there is a growing consensus that data, and the

evidence-based decision making it enables, leads to more consistently effective practice than reliance on conventional wisdom or “gut” instinct.

Yet, it is not enough to simply open up state government data vaults for mass consumption; state leaders must position their organizations for success in an increasingly data-driven world. To increase the utility of public and online data, state governments must develop the analytic capabilities to share and manipulate the data they collect, along with the increasing volume of unstructured data available online.

We are only starting to understand the ways in which state agencies can leverage data to improve performance and minimize risks. But we know that the potential for using mashups, crowdsourcing, analytics and other techniques to transform data into meaningful knowledge is tremendous.

“The ability to take data — to be able to understand it, to process it, to extract value from it, to visualize it, to communicate it — that’s going to be a hugely important skill in the next decades.”

~ HAL VARIAN, CHIEF ECONOMIST AT GOOGLE

ACTION PLAN FOR BUILDING THE INTELLIGENT STATE ENTERPRISE

State leaders have an opportunity to combine the resourcefulness of online citizens and entrepreneurs with the power of factual data to more effectively achieve their mission. These actions can help states to realize the tremendous promise of data analytics:

Educate staff and managers on what real analytics can do

Many state managers and workers don't have strong, up-to-date knowledge of the value analytics can have in transforming government. The education campaign should focus not only on training state workers in the "what" and the "how" of analytics but also more generally in how to evolve to a more evidence-based culture.

Focus analytics on your core mission

The vastness of the public data that exist can lead state agencies to lose focus on the purpose of data analytics. Efforts to develop analytical capabilities need to be driven by an agency's core mission and its most important issues and priorities. When data provide insights that challenge accepted norms, it is important to be ready to adjust strategies and tactics.

The Illinois Department of Transportation (IDOT) has built a business intelligence platform that gives employees direct access to important data that had previously been trapped in many separate

information silos. Dashboards allow employees to draw data from multiple IT systems in order to perform analyses and monitor performance. For example, a fatalities dashboard allows IDOT to analyze causes connected to fatal accidents, such as speed, alcohol, weather and improper use of lanes.

Data analytics is only as valuable as its influence on actual decision-making. Analytics capabilities and outputs need to be deeply embedded in the processes of everyday work.

Approach data analytics as a new core competency, not a new tool set

All too often, state agencies believe that the powerful tools that exist to analyze vast data stores are the sole answer. This is far from the case. Organizational competencies, data ownership policies, cultural norms and management processes all need to be rethought if analytical power is to be exploited. The Commonwealth of Kentucky, for example, is not only building new analytics capabilities for the child support enforcement program, but also identifying changes to existing business processes required by implementing the new tools.

What works: Oregon Progress Board

The Web site of the Oregon Progress Board (<http://benchmarks.oregon.gov/>) allows users to generate reports that measure the state's progress toward three strategic goals: quality jobs for all state residents; safe, caring and engaged communities; and healthy, sustainable surroundings. The reports are based on state data on the economy, education, civic engagement, social support, public safety and the environment, along with data from the state's counties.

In 2008 and 2009, the Colorado legislature lowered the barriers to collaboration and information sharing among state agencies and then set up a structure to develop protocols for more robust sharing and use of data at all levels of government. A new chief data officer and her staff have since set out to capture all state data and work processes, with an eye toward eliminating redundancies and finding data-sharing opportunities that can boost efficiency and the quality of decision making. As an example, they developed a system to share juvenile justice information among state and local agencies and the courts — the idea being to create a comprehensive look at each youngster in the penal system and guide decisions about their education and social service needs.

Weave analytics into the fiber of state government

Data analytics is only as valuable as its influence on actual decision-making. To make a real difference, analytics capabilities and outputs need to be embedded deep in the processes of everyday work, from agency heads to the front lines.

Develop data visualization capabilities

One way to make sure the output of data analytics delivers insights state employees and executives can use is by not burying them in a blizzard of incomprehensible data. Well designed interfaces and data visualizations let users easily understand and act on the results or drill down for more

7-6. Major cloud computing categories

	Service type category	Description of the different service categories
Major cloud computing categories	Software-as-a-Service (SaaS)	A model of software deployment whereby a provider licenses an application to customers for use as a service on demand. SaaS software vendors may host the application on their own Web servers or download the application to the consumer device.
	Platform-as-a-Service (PaaS)	The delivery of a computing platform and solution stack as a service. It facilitates the deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers. It provides all of the facilities required to build and deliver Web applications and services entirely from the Internet.
	Infrastructure-as-a-Service (IaaS)	The delivery of computer infrastructure as a service. Rather than purchase servers, software, data center space, or network equipment directly, clients instead buy those resources as a fully outsourced service. The service is typically billed on a utility computing basis.

Source: Deloitte

information. Involve the users of the data in the design. They will tell you when the amount of data they're getting is too much or too little.

Enlist key partners inside and outside your agency

The pioneers in data analytics quickly learned that the interrelationships they needed to understand required data outside their own domain. Even within state agencies, the culture of localized data ownership needs to be overcome to extract maximum data value.

In addition, the utility of previously untouched data for both citizens and government employees will depend on how easy it is for stakeholders to manipulate the data to their benefit. Finding the right format will require a more collaborative relationship among users across state, federal and local government and in the community.

Leverage the online community

The online community can be encouraged to mashup state data in innovative ways. Citizen-led data analytics should be brought into policy analysis, where feasible, given the imagination and resources that exist outside government.

Through its Data.ca.gov Web site, California makes raw state data available to citizens and organizations that want to incorporate it in their own applications. The site also provides a link to a variety of tools that allow users to query state agency databases and download raw data. The state's Apps for California competition resulted in numerous innovative approaches for making it easier to analyze state and local government data.

Roadblocks to overcome

Making data usable

State governments are drowning in data.

Determining how best to harness this flood of information, much of which currently resides in disparate systems, and transferring it into an accessible, usable format will be extraordinarily difficult.

Mitigating privacy concerns

Privacy issues pose a serious challenge. Much of the data that state governments collect draw upon very personal interactions with citizens. In no area is this sensitivity greater than the health arena, where improved decision making often requires drawing upon the personal experiences of patients.



Interview with

Dave Fletcher

Chief Technology Officer,
State of Utah

Q..Utah has been a pioneer among states in everything from cloud computing and IT consolidation to mobile apps and social media. Why Utah?

Back in 1993, Governor Mike Leavitt encouraged our state agencies to do innovative things like opening government data to the public — things that have only recently come into vogue. Although the public was only just discovering the Web, leaders from the governor on down started putting a lot of emphasis on how to make things happen online. On top of that, our population is pretty tech savvy. Our residents have been connected to the Internet for some time.

Q..A lot of states have found IT consolidation to be more difficult to implement than they anticipated. How did you do it?

Obviously, agencies want to be able to control their own destiny, and IT is an important part of that. It's important for IT to work closely with agencies and provide assurances that their needs will continue to be met after an IT consolidation.

Our legislature passed legislation back in 2005 saying that we would consolidate IT. It was very helpful to have that encoded in law. Particularly with budget constraints, it makes a great deal of sense to consolidate. It eliminates wasteful duplication and creates opportunities to do things more cost effectively. We've reduced full-time equivalent count by about 20 percent — that's \$10 million to \$20 million a year.

Q..Utah is a leader in cloud computing. What are you trying to achieve, and why?

We're taking a hybrid, private-public approach to leveraging the significant benefits of doing business in the cloud. Through data consolidation and virtualization of our server farm, we've dramatically reduced our number of physical servers. And we're now able to provision virtual servers to our users in our private cloud. In the past, when an agency wanted a server, buying and installing it was a lengthy process. Now, we can do that instantaneously. We can take advantage of public cloud services in the same way.

Q..Some people believe that states could see massive savings if they developed shared, regional IT services for applications such as unemployment and child welfare. What is Utah doing in that regard?

We're working with other states on a variety of initiatives. For example, our Department of Corrections management system was developed in conjunction with about 14 other states. Right now, we've got an effort with four other states to look at a pilot MMIS system for Medicaid. Those systems generally cost upwards of \$100 million. We've been working with Vivek Kundra, the federal CIO, as well as with Minnesota and other states on this project to see if we can develop a shared approach to a Medicaid information system. I think that holds tremendous potential.

Q..What about mobile? What do you see as the future of mobile government?

We were the first state to put out an iPhone app. But our goal is to facilitate services on whatever platform our users choose. Ultimately, we'd like to provide more platform-independent applications and services. We've been using HTML 5 to develop some of our apps, so eventually they will be cross-platformed to any browser that supports that standard.

Q..What do you think will be some of the big game changers in mobile government — the ones that will dramatically change the way public workers do their jobs?

We've already done some things that I think are leading in this area. For example, we've given our public safety public information officer (PIO) tools that use Twitter, Google Maps and other Web 2.0 services to provide information from the field to the media. Using an iPhone, the PIO can upload video that is then shared with TV stations and other media, as well as with the public.

Q..How would you capitalize on the vast amount of data states collect to make better decisions through data analytics?

First, we provided a front end to all of our accessible data through our Data.Utah.gov service. Internally, we take a centralized approach. We have an enterprise contract that is used extensively by both our executive branch and by public and higher education to improve their capabilities to understand the data that they control. We have a statewide financial system that's used by all of our agencies with associated analytic services that agencies use to understand the data. We have similar systems for managing our state facilities and our fleet of 7,500 state vehicles. We save millions of dollars through doing that kind of analysis at a state level.

Q..What are some of the big technology trends that you're seeing on the horizon that states need to be aware of or at the forefront of?

We need to shorten project development cycles and make development more agile and responsive to new technologies, leveraging new services as they become available and staying aware of what's happening globally. I learn a lot from innovation in Barcelona, Singapore and other areas that are doing some very creative things that make government more effective. I think we need to look seriously at the way we're doing budgeting and sometimes locking ourselves into obsolescence by conducting inflexible, multi-year projects.