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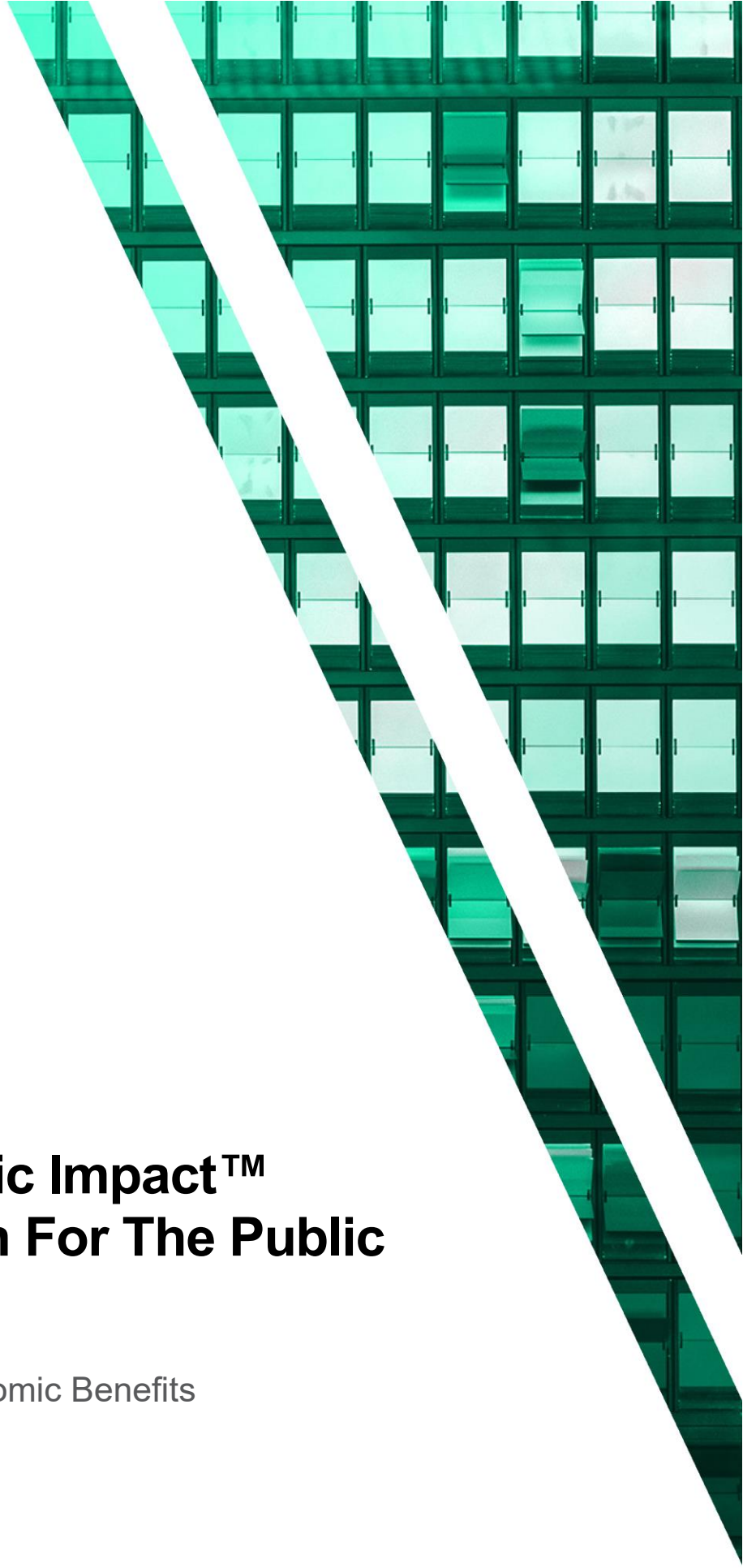

# The Total Economic Impact™ Of Data Integration For The Public Sector

## Cost Savings And Socioeconomic Benefits Enabled By Data Integration

**JULY 2023**

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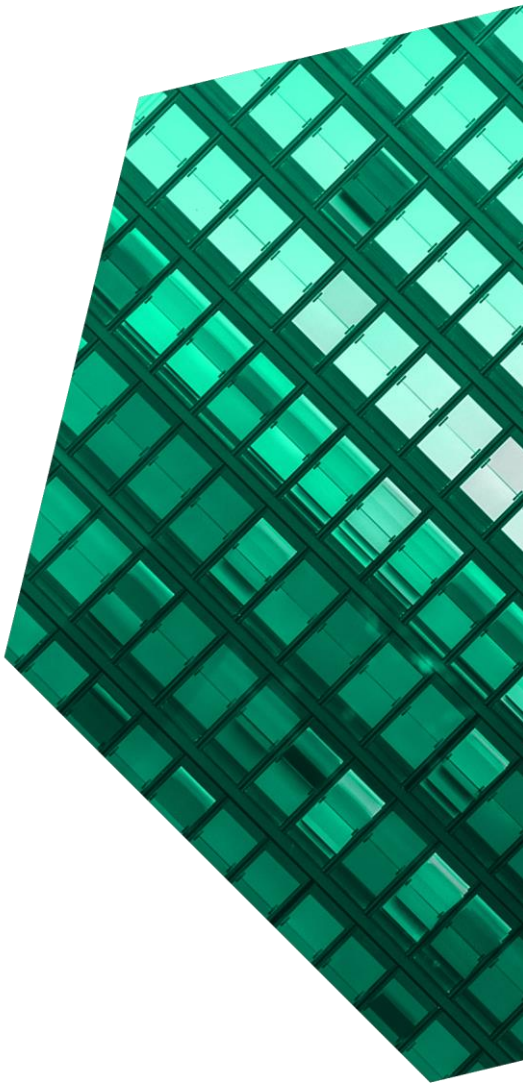


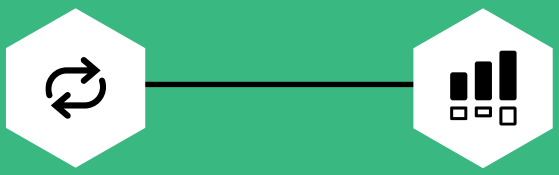
## Executive Summary

In today's data-driven environment, organizations generate and maintain more data than ever.[1] With new abilities to securely and compliantly exchange and integrate multiple forms and sources of data with partners, public sector organizations can improve operational efficiency and reduce costs while increasing the quality and quantity of the services they deliver. While the cost of launching an integrated data system usually increases linearly over time, the value of data integration often grows exponentially.

Early responses to the COVID-19 pandemic demonstrated the importance of an agile and coordinated public sector. Most public organizations that responded quickly and effectively to the pandemic had something in common: They had a system in place to share data easily and securely.[2] Because of data sharing, scientists sequenced the DNA of the coronavirus and devised vaccines faster than they ever could have before, while policymakers and healthcare workers relied on shared data to understand the impacts of the pandemic and make effective decisions.[3]

Data exchange is primarily the one- or two-way electronic sharing of information, including personally identifiable information (PII), with a government or private entity.[4] Data exchange can allow stakeholders to collaborate on shared priorities and track metrics and outcomes across departments or programs. Data integration is a type of data sharing that involves record linkage, which is the joining of data based on common data fields such as name, license number, or an encrypted "unique ID" that is used to link or join records at the individual level.[5] Data integration often requires organizations to modernize their data structures and data management practices, and it provides an opportunity for organizations to improve their data security and establish new data standards. Investments in data integration are typically accompanied by the establishment of a data unit that manages the organization's data infrastructure, governance, integration, and use.

**KEY STATISTICS**



Five-year return on investment (ROI)
**33%**

Net present value (NPV)
**$5.8M**

Societies will face more frequent and more severe emergencies during the next few decades amidst rising geopolitical tensions, economic stress and uncertainty, and climate crises.[6] Public organizations that invest in data sharing and integration now will be better equipped to serve constituents in the face of these events, and they can make these investments gradually. Even small public organizations that can't make a large financial investment up front can achieve these benefits. In addition to increasing agility and collaboration, data sharing and integration investments may also help organizations increase their operational efficiency and reduce their costs through shared infrastructures and economies of scale, which can save them money in the long run.

Beyond responding to crises and public-health emergencies, data sharing and data integration help public sector organizations improve service delivery and protect constituents across nearly every domain, including social services, police and fire responses, education, emergency management, and physical

and environmental health.[7] Data sharing and integration can be used to automate manual data-related processes, to decrease reliance on external vendors, and to improve and expand the delivery of constituent services.

Amazon Web Services (AWS) commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) public-sector organizations may realize with investments in data integration.[8] The purpose of this study is to provide readers with a framework to evaluate the potential financial and socioeconomic impact of data integration for public sector organizations.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed 10 representatives from eight public-sector organizations that invested in, helped implement, or helped manage data integration and sharing. These organizations were primarily in the K-12 education and health and human services domains.

For the purposes of this study, Forrester aggregated the interviewees' experiences and combined the results into a single composite organization that is a state government agency that invests in data integration and creates a data integration and management unit to help the state, local state organizations, and constituents realize value from data integration.

Interviewees noted that prior to their organizations' investments in data integration, their organizations managed individual data systems and did not integrate data between departments, agencies, or districts. They didn't prioritize data management, they lacked staffing capacity and technical expertise, and they often only tracked and reported data to meet requirements. This led to the underutilization of data to inform decision-making and to track constituent impact, duplicative work across local organizations, inequitable and inefficient service delivery, and security risks associated with manual data practices.

After investing in data integration, the interviewees' organizations improved operational efficiency, reduced costs, supported data-driven research and policymaking, and developed better and faster service delivery.

> **"The agencies themselves are achieving and seeing [a positive] return on investment as a result of our efforts. And that is from a top-down initiative [driven at the state, not local, level]."**
>
> *Chief data officer, state data agency*

## KEY FINDINGS

**Quantified benefits.** Five-year, risk-adjusted present value (PV) quantified benefits for the composite organization include:

- **Process and operational efficiencies totaling more than $15 million in savings over five years.** The composite organization automates and improves the efficiency of existing processes such as data entry, reporting, and the fulfillment of data requests. Its newly established data integration and management unit also takes on tasks that local organizations previously ran, which enables efficiencies of scale. Overall, employees reduce the time they spend on manual data activities by 85%, saving more than 200,000 hours of labor across the state.
- **Accelerated time to value, saving more than $2 million.** With improved data access, the composite is quicker to make decisions, responds to crises, and deliver services. Data-driven decision-making and real-time feedback help the organization reprioritize and adjust

service delivery on an ongoing basis. Ultimately, the composite reduces the time spent responding to changing needs and deploying new services by 30%. This saves it almost 30,000 hours in the fifth year of the initiative being live.

- **Direct cost savings of $3.5 million.** The composite organization directly reduces its expenditures on external vendors and service provision by up to 10%. In addition, the composite saves $68,000 annually by retiring 85% of its legacy technology, such as old servers or software.
- **Reduced exposure to significant data risk by 65%.** Better data management practices improve the composite's data quality and security and reduces the likelihood that it will experience significant data risk events such as lawsuits, data breaches, and data errors. Over five years, this risk reduction saves the composite organization more than $2 million.

2022 value created by a health information exchange through the provision of data-related services:

**$9.3 million**

**Unquantified benefits.** Benefits that provide value for the composite organization but are not quantified in this study include:

- **Value creation through the provision of data-related services.** Several interviewed decision-makers at public sector data units noted that their organization charges or is planning to start charging other public and private organizations for the data services they provide. Some of the services provided include report delivery and the integration of siloed data systems.
- **Educator time savings.** Teachers spend less time manually handling or verifying student data due to process automation enabled by data integration. Principals also use classroom data to help inform teacher-effectiveness evaluations.
- **Improved decision-making among federal, state, and local-decision makers.** Multiple interviewees said their organization delivers data dashboards and reports to agencies, legislators, and organizations to help them monitor initiative success and inform data-driven decision-making.
- **Evidence-based, real-time program-tracking and improvement.** Interviewees said improving data quality and having easier access to data allows their organizations to deliver data more frequently. They also said their organizations have started to track program-outcome metrics across departments and are able to make real-time improvements to their services.
- **Greater equity of service provision across local organizations.** States can assess constituent data such as test scores, crime rates, or vaccination rates across local organizations to determine where resources would best be distributed. They can then allocate those resources locally to wherever they are needed most. Additionally, having data infrastructure that is more established and automated can reduce the manpower and technical expertise needed to utilize data at the local level.
- **Facilitating or enabling academic research.** The goal of education research is ultimately to answer questions that can spur meaningful change and improve outcomes for schools and students.[9] To answer these questions, researchers often need access to both aggregated and student-level educational data. Interviewees said having a centralized data

management body to make data available and garner permission from local districts helped their organizations provide academic institutions or programs with aggregated and cross-program data to support their research. When research is published, it can be used to further improve service delivery and decision-making.

- **Development of applications or standards that can be used by other organizations.** New or improved processes, applications, or data standards add to a repertoire of work that can be utilized across an entire domain or similar organizations across a state or a country.
- **Increased agility and scalability.** Tracking program progress and outcomes across departments and services helps organizations adjust directions or make improvements to services to respond to changing needs. Data framework development in one area can expand to additional domains and facilitate statewide initiatives at a lower cost than new development.
- **New and improved services improving constituent experience and outcomes.** Interviewees said data exchange and integration helped their organizations reduce crime, decrease DMV wait times, and improve education strategies, among other benefits.

**Costs.** Five-year, risk-adjusted PV costs for the composite organization include:

- **External costs, including data infrastructure and licensing, totaling $3.4 million.** The composite organization works with an external vendor to help with implementation, and it spends $750,000 on the vendor, data infrastructure, and licensing during the three-year implementation period. This cost decreases to $350,000 in Year 1 after initial implementation is complete, but it grows thereafter as the unit manages more data and provides additional services. The composite also faces legal fees, insurance, and rent costs totaling $600,000 during the modeled three-year implementation period and five years of operation.
- **Data integration and management unit labor costs totaling $9.2 million over eight years.** The composite organization sets up a new unit to manage all its data integration operations and services. The staff of this data unit grows from one employee to 18 by the fifth year of operation as the unit expands its duties and works with new organizations and data sources.
- **Planning oversight and organizational labor totaling $5.1 million.** Existing employees at the state level invest their time to support the data initiative in planning the investment and execution, distributing funding, hiring initial employees, and providing oversight and advice to the unit. Employees at participating local organizations also invest their own time when joining a new data system, both from a technological and change-management perspective. The average cost for each organization to join the initiative is $50,000, which includes the costs of integration, change management, and training.

The representative interviews and financial analysis found that the composite organization experiences benefits of $23.3 million over five years versus costs of $17.4 million, adding up to a net present value (NPV) of $5.8 million and an ROI of 33%.

> **“The stakeholder ROI not in dollars, but in service is very, very high.”**
>
> *Director of research and data analysis, state education agency*

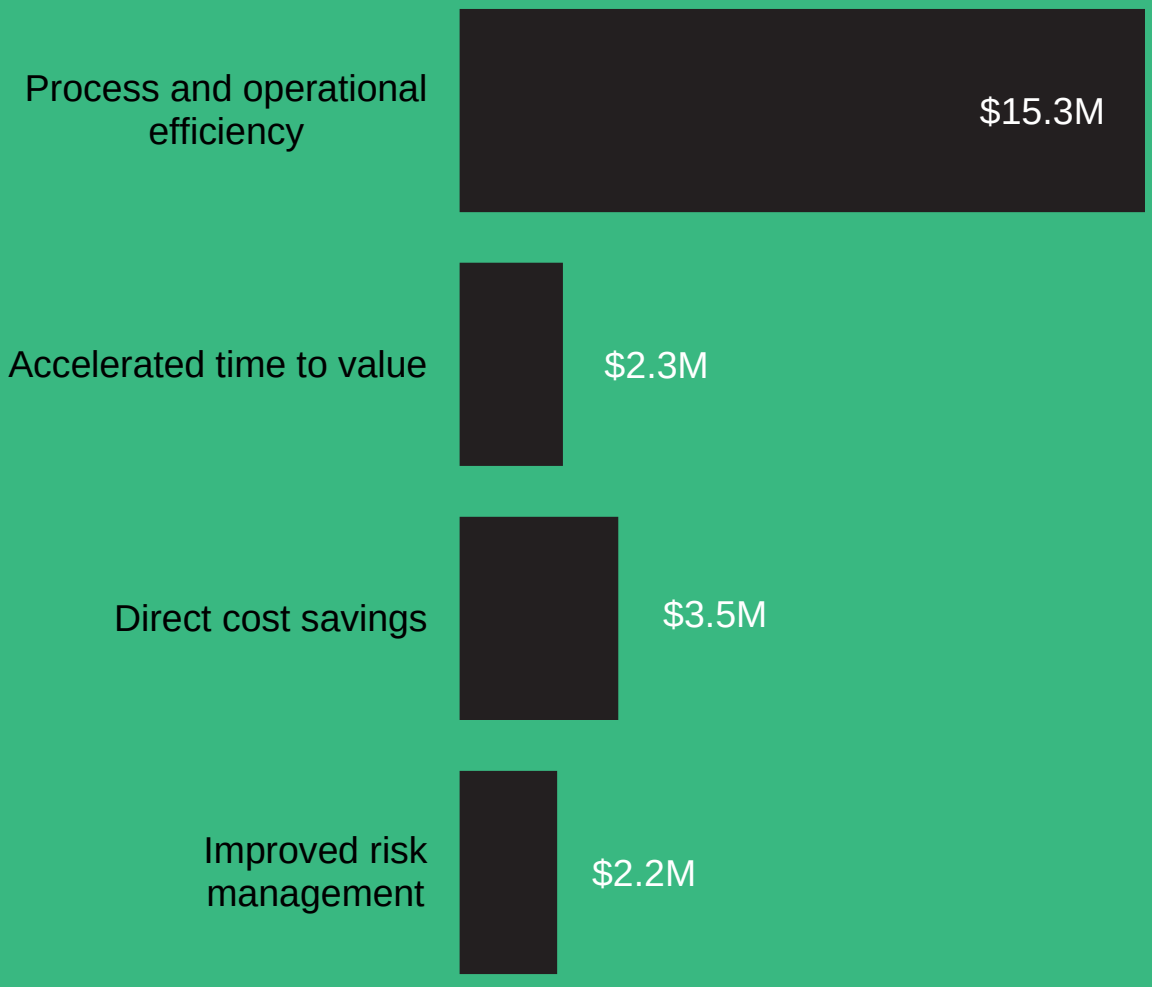
ROI
**33%**

BENEFITS PV
**$23.3M**

NPV
**$5.8M**

PAYBACK
**34 months**

## Benefits (Five-Year)



## TEI FRAMEWORK AND METHODOLOGY

From the information provided in the interviews, Forrester constructed a Total Economic Impact™ framework for public sector organizations considering an investment in data integration.

The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision. Forrester took a multistep approach to evaluate the impact that data integration can have on public sector organizations.

### DUE DILIGENCE

Interviewed AWS stakeholders and Forrester analysts to gather data relative to data integration for the public sector.

### INTERVIEWS

Interviewed 10 representatives at eight organizations using data integration in the public sector to obtain data with respect to costs, benefits, and risks.

### COMPOSITE ORGANIZATION

Designed a composite organization based on characteristics of the interviewees' organizations.

### FINANCIAL MODEL FRAMEWORK

Constructed a financial model representative of the interviews using the TEI methodology and risk-adjusted the financial model based on issues and concerns of the interviewees.

### CASE STUDY

Employed four fundamental elements of TEI in modeling the investment impact: benefits, costs, flexibility, and risks. Given the increasing sophistication of ROI analyses related to IT investments, Forrester's TEI methodology provides a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

# The Data Integration Journey For The Public Sector

Drivers leading to the data integration for the public sector investment

## Interviews

| Role | Organization | Region | Deployment |
|---|---|---|---|
| Director of systems integration | K12 educational service agency (ESA) collaborative | Midwest | Initially deployed on-premises, moved to cloud |
| Director of analytics and reporting | State education agency | Midwest | Initially deployed on-premises, partially moved to cloud |
| Director of systems evaluation and technology | State education agency | Midwest | Initially deployed on-premises, moved to cloud |
| Executive director | Health data unit | Midwest | Initially deployed on-premises, moved to cloud |
| Senior director of outreach and communication | Health data unit | Midwest | Initially deployed on-premises, moved to cloud |
| Director of healthcare innovation | Health department | Northeast | Hybrid deployment |
| Director of research and data analysis | State education agency | Southeast | Initially deployed on-premises, moved to cloud |
| Chief executive officer (CEO) | Education nonprofit and implementation partner | Midwest | Initially deployed on-premises, moved to cloud |
| Chief data officer | State data agency | Southeast | Initially deployed on-premises, partially moved to cloud |
| Deputy chief data officer | State data agency | Southeast | Initially deployed on-premises, partially moved to cloud |

### KEY CHALLENGES

Before they invested in data integration, departments, agencies, and districts in the interviewees' states managed individual data systems. They often worked with old data systems and handled multiple contracts with external vendors to provide data services that they didn't have the capacity to take on internally. Gaps in technical knowledge or expertise were pervasive, especially at smaller local organizations that did not have well-established data management practices. Larger, more sophisticated organizations often had more technical resources and more personalized infrastructures, such as custom data warehouses or in-house support. However, most set up individual integrations with services or systems used at the organizational level and didn't integrate data structures or data sets with other departments, agencies, or districts in the state. The interviewees noted that their organizations struggled with common challenges, including:

- **Underutilization of data to inform decision-making.** As described by the CEO of Education Analytics, a non-profit in the education space, the field of education is data rich but information poor.[10] While the interviewee's organizations often had access to large amounts of data, many of their preexisting data-related processes and management practices were manual and error-prone. The organizations relied on humans to collect, input, aggregate, analyze, and transfer data, which led to frequent data mismatches and errors. Data was often underutilized due to a lack of trust, technical expertise, and staffing capacity. The CEO of an education nonprofit and implementation partner told Forrester, "You have massive turnover and essentially no useful data or analytics coming out of school districts."

  Without data access, data could not support decision-making at the local or state level. The director of systems integration at a K12 ESA collaborative noted that part of the initial value

proposition for the creation of a data unit in their state was the inability of the state legislature to obtain data to inform their decisions. Additionally, delayed or infrequent access to data stymied action and decision-making in response to time-sensitive events and services.

**"Everybody was [dealing with data in] a different way. There were no standards."**

*Chief data officer, state data agency*

- **Duplicative and inconsistent work across organizations.** Districts and agencies were often doing the same work in different ways, which created inefficiencies and hampered communication and coordination between systems or organizations. The executive director at a health data unit said: "It's very frustrating if you show up for a doctor's appointment and they don't have your lab results. It's also an opportunity for misdiagnosis." The director of research and data analysis at a state education agency noted that a lack of technological awareness and inconsistent data structures kept districts from easily sharing data. They said, "There was no integration of the data and no longitudinal value of the different data sets because they were distinct."
- **Inequity of data resources.** The director of systems integration at a K12 ESA collaborative noted, "There's massive inequity across the state, in terms of capability to manage data."

  Especially for education districts, larger organizations would have a large, robust IT staff while smaller districts might have just one person in charge of all data and technology-related operations. The quality-of-service provision for students or constituents often mirrored this inequity.
- **Insecure data management practices.** Interviewees said that without well-established ways to securely store and transfer data, their organizations managed data in risky ways, such as sending PII via unsecure emails or leaving it on open laptops.

  The deputy chief data officer of a state data agency said: "[We] saw scenarios where there was unauthorized access to data [and] where folks who should have access to non-sensitive, non-PII data sets weren't getting access. So, [we] saw the full gambit of access-control issues, repository-control issues, [and] basic governance issues within all the different agencies."

**"The goals were to create shared infrastructure to be able to enable what we refer to as use cases [and] sharing multiple kinds of data across the entire state [and] entire ecosystem. And it all falls into the category of broad interoperability, so that if a patient does something in one part of the state, the doctor they see in another part is aware of what's important."**

*Executive director, health data unit*

- **Legacy systems that were difficult to maintain.** The organizations used outdated technology, such as old software that was no

longer regularly updated and data servers that were clunky and slow. High rates of turnover caused knowledge loss, and the organizations struggled to hire new employees with experience using their software.

- **An inability to demonstrate the effectiveness of state programs and spending.** With poor data access, interviewees' organizations struggled to track their impact. The CEO of an education nonprofit explained: **"**More and more legislators are asking, 'We're spending all this money on public education, what are we getting out of that?' And [the state or local organizations] can't answer that question."

### INVESTMENT OBJECTIVES

Some specific goals the interviewees had for their state's investment in data integration included:

- Streamlining the connectivity between disparate data systems.
- Improving data quality and consistency in reporting.
- Consolidating vendors and data systems to realize cost efficiencies.
- Enabling faster and more data-driven decision-making.
- Achieving the flexibility of cloud data hosting.
- Improving and measuring outcomes such as teacher impact, COVID-19 pandemic learning loss, or the care-provider experience.

**"Quality of care, coordination of care, cost of care, and equity has become the quadruple aim."**

*Executive director, health data unit*

### COMPOSITE ORGANIZATION

Based on the interviews, Forrester constructed a TEI framework, a composite organization, and an ROI analysis that illustrates the areas financially affected. The composite organization is used to present the aggregate financial analysis in the next section and has the following characteristics:

**Description of composite.** The composite organization is a US state government with local departments, agencies, and districts. The organization initially focuses its data integration efforts in one domain, such as education, health services, or social services. There are 95 local organizations within that domain in the state that participate in the data integration initiative.

**Deployment characteristics.** The legislature at the state level undertakes a statewide data sharing and integration initiative, and it allocates state funding for the initiative supplemented by a federal grant. The state forms a data integration and management unit that is affiliated with the state government but politically and operationally independent. The unit is overseen by a board that includes representation from employees at both the state level and local organizations. The data integration and management unit chooses a cloud-first deployment and hires an external vendor to help set up its data infrastructure and provide ongoing support. Among other services, the data integration and management unit operates a centralized data system that connects the data between the state, local organizations, and other public or private organizations that choose to participate in the initiative, which goes live three years after the start of the initiative. To successfully integrate data between organizations, the data unit helps participating organizations across the state implement data management practices and standards around data collection, governance, and use. The data unit supports change management of people and processes as well as technology and infrastructure. The unit reaches an employee count of 18 by the eighth year after the start of the initiative.

**Key Assumptions**

- **Midsize US state**
- **95 local organizations in the domain of focus**
- **6 existing data-focused, state-level employees**

## IMPLEMENTATION: LEARNINGS AND BEST PRACTICES

*Data infrastructure:*

- Public sector organizations often work with implementation partners to provide technical and advisory resources and to help implement data infrastructure, ensure data security, and develop applications. These partners can be specialized for the public sector or even for specific domains such as education. Often, organizations that work with an external vendor are beholden to a specific infrastructure provider that's partnered with the vendor.
- Organizations may also work directly with a technology provider such as Amazon Web Services (AWS), which can provide services to help guide organizations through implementation and development in addition to data infrastructure itself. As a common infrastructure provider in the education space, AWS works with numerous implementation partners in the public-sector space and is continuing to develop and support tools and frameworks in the public-sector space. One example of this kind of framework is the Ed-Fi data standard, an open-source set of rules for the collection, management, and organization of educational data that allows multiple systems to share their information seamlessly.[11]
- Nearly every interviewee said their organization began its data infrastructure deployment on-premises but later moved it, or that the organization is in the process of moving some or all of its data to the cloud. Interviewees cited security, flexibility, and reduced maintenance needs as the primary reasons for migration. The director of healthcare innovation at a health department noted: "[Being in the cloud] shifts us so we can approach a project differently in the sense of, 'Can we get the staff?' We can get the staffing to do things in the cloud if they use out-of-the-box data warehousing things like Snowflake or [Amazon] Redshift that are more supported in the cloud. That relieves a lot of the staffing on our side to be able to support what would normally be an on-premises Oracle database."

**"[The cost of] insurance is going up, and the [organization] that's hosting the data is very nervous about having that data on [its] premises, and nobody else seems to want to host it locally. And, so, AWS or virtual hosting becomes the natural choice."**

*Director of systems integration, K12 ESA collaborative*

*Data governance and implementation:*

- Data governance structures can be centralized or federated, and the interviewees said their states approached data sharing both ways. With centralized architecture, each organization uploads its data to a centralized web server. A centralized trusted data source works best when all parties have similar goals.[12] With federated architecture, a decentralized network connects data sources. The data stays at each respective institution, but each institution must implement an interface to make the data findable but not necessarily accessible. With a federated approach, organizations that own data are responsible for it, and they can implement privacy-preserving record linkage (PPRL) to preserve it. This lowers barriers to communication by not sharing PII.

**"The goal is not necessarily just to be cloud-based, but to have the flexibility that the cloud provides [and] to be able to share information and work with vendors that can support the quick deployment of systems and constant improvement of systems that it's harder to do with on-premises stuff."**

*Director of healthcare innovation, health department*

- Most of the interviewees' organizations set up an advisory board or committee that included representatives from the state and local organizations. These committees help facilitate collaborative progress and ensure that the interests of all stakeholder groups are represented.

**"Rather than forcing districts to change data systems — which would be painful — we set up a standard-based system [that worked] no matter what they were using. As long as it adhered to the standards, it would look like a single common system."**

*Director of systems integration, K12 ESA collaborative*

*Common concerns:*

- **Keeping investment costs manageable.** The CEO of an education nonprofit and implementation partner described that many public organizations have delayed or decided against data integration investments over cost concerns. While large-scale data integration can be expensive, organizations can also make smaller phased investments to gain incremental benefits. Regardless of investment size, interviewees noted that once implementation is complete, the costs of data sharing investments generally scale incrementally. Over time, the data system adds data and expands its capabilities while the value grows exponentially as additional organizations participate.
  - The interviewees' organizations funded their data integration initiatives through combinations of the state budgets, municipalities, federal grants, and

nonprofit organizations. Interviewees said to gain approval from grant sources, it is helpful to determine a starting use case and the data to be collected and shared and create a feasible plan.

- One of the interviewee's organizations designed a model to spread the costs across multiple participating entities. A group that manages the data solution may operate as a contracting entity and bill participating organizations for their services.

**"Start small with a basic thing that everybody's going to use."**

*Director of healthcare innovation, health department*

- **Maintaining autonomy for local organizations.** The interviewees' organizations used several different approaches to help local organizations maintain levels of control with which they were comfortable. Often, that looked like a federated data governance structure. The director of analytics and reporting at a state education agency said their organization's favored approach is standing up data hubs for local organizations and allowing them to manage the hubs themselves while being supported by the central data unit. The interviewee told Forrester: "[What we want is] not the state coming in [and] saying, 'You will do it this way.' It's the locals deciding themselves how to manage their data." The agency also worked to minimize the level of disruption and change management required of organizations for them to join the data system.
- **Preserving the security of shared data.** Private-sector data security practices have evolved rapidly with technological innovation that may be applied to the public sector as well. The interviewees said their organizations prioritized security and they described their states' data security practices as more advanced than they were before investing in data integration. Interviewees' organizations took action to protect and ensure data security by:
  - Merging data into a crosswalk as they enter the shared system in a de-identified way where all PII is removed.
  - Tracking manual changes with an audit log and utilizing alert functionality that sends email alerts when users or integration settings are changed.
  - Protecting API integrations with a key and secret process with transaction encryption.
  - Leveraging secure file transfer protocol (SFTP) credentials for inbound and outbound integrations.
  - Encrypting web traffic with secure socket layer (SSL) encryption.
  - Encrypting storage area network (SAN) drives so that physical theft of a drive would not allow for data retrieval.
  - Encrypting databases so that a database backup cannot be restored without the proper keys.
  - Enclosing the entire data network in a virtual private network (VPN).
  - Encrypting credential details in a database accessed by data leaders.
  - Continuously monitoring the infrastructure for unauthorized access to data and

systems, including weekly scanning through US Cybersecurity and Infrastructure Security Agency (CISA).

- Disabling districts' data integration capabilities until their superintendents or their proxies electronically sign a data hosting agreement (DHA) that spells out the terms and conditions of using the system.
- Requiring professional development and data security training for all staff.

*Recommendations from interviewees and Forrester research:*

- **Lead with a small use case that will have immediate value.** Interviewees advised that public-sector organizations looking to invest in data integration should take a business-driven approach rather than a technology-driven approach. In other words, don't lead with the data infrastructure and assume value will follow. Some states that focus on their infrastructure first and work with vendors to build big-data management capabilities and hope their use cases will be supported find that the scope and costs balloon and abandon the project. Instead, interviewees recommended taking an incremental approach and reusing the investment to get value in multiple areas.

  The director of healthcare innovation at a health data unit said: "Hopefully, the shift in procurement we're going to be seeing over the next few years is a more iterative process rather than the Big Bang procurement of 'I'm going to put up this big, giant project where we can describe all the objectives and all the requirements in beginning.'"

- **Build for the future.** Interviewees said even if an organization takes a stepwise approach to a data integration investment, the most sustainable model will be designed for growth. They said a monolithic system designed to only serve a single domain or type of participating organizations will at some point reach a technical debt that will limit its ability to serve multiple domains and will require reinvestment in infrastructure and labor to accomplish new goals. Creating a decoupled system that is flexible and scalable will allow new areas of value to be substituted in, not added on. While it will likely cost more early in the process to bring future stakeholders together and design a system that will serve all, interviewees said the long-term value is undisputable.

- **Find legislative and executive support early and establish a communication channel.** The chief data officer with a state data agency said members of their state legislature sit on the data department's advisory commission and that the commission meets with the state legislation at least twice a year to discuss progress, potential challenges, and issues the department is dealing with that could affect the legislation. Even with legislative participation, executive branch support is critical.

  The chief data officer said: "I have top-down administrative support. All the cabinet secretaries believe in [what] we're trying to do and the differences that we're trying to make for constituents and for the state. If you don't have that support, you're going to be dead in the water. That makes dealing with the agencies a lot easier." Interviewees said that even if early support is established, it is important for representatives of the data initiative to identify key decision-makers at both the state and local level and to establish a clear and open vehicle for communication with those organizations and individuals.

- **Implement data standards to create a single source of truth.** Interviewees said early commitment to data standards and structures

that can be universally adopted by local organizations will smooth the data integration process and create efficiencies in management. Organizations do not need to overengineer their own standards, but they should look to existing open data standards or rules, such as the Ed-Fi data standard or Health Level Seven. Forrester recommends that organizations build cross-departmental data catalogs and governance policies to break down silos between internal divisions.[13] Keeping data inventories and processes transparent will also make it easier for collaborating departments to find and gain access to the necessary data.

- **Prioritize trust and transparency with participating organizations.** Interviewees described that any data sharing organization's biggest asset is trust, and once trust is lost, it cannot be bought back. It is important to be transparent with all stakeholders and partners across a community about what information is being shared, who has access to it, how it is being used, and how the data integration will ultimately benefit all parties. Incorporating accountability and audit capabilities into data sharing terms and conditions helps foster bidirectional data governance. In addition, take into account local organizations' existing trust levels and comfort with data sharing across partners. Local organizations may trust regional partners more than the state.
- **Don't skimp on change management.** Most interviewees acknowledged that the most important and most difficult part of implementing a state data integration system is the human element of change management rather than technological change. They said a successful transition requires buy-in throughout the process lifecycle, from legislator buy-in to approve and resource a project to local employees who need to change their ways of working to constituents whose data is being handled.
- **Document wherever possible.** Documentation benefits all parts of a data operation, including security, quality, and management.[14] Documentation can also help ensure an initiative's longevity in the face of employee turnover. Forrester research recommends that organizations document and provide clear, comprehensive specifications of all data products to limit surprises when integrating data and determining data's value.[15] Those specifications should include the metamodel, the number of data rows, the frequency of updates, the level of quality, and the data context including how it was obtained, how it was treated or transformed, how it was accessed, and how it has been maintained.

**"Now, we have a high-trust infrastructure that is very scalable, but also very secure. With [data integration powered by] AWS, you have an array of tools available. When we had a point data center, we had to get [tools] installed and do a bunch of things. All of that becomes not only so much easier and goes so much faster, but it boosts your credibility, which boosts everybody's willingness to trust the infrastructure to share more information. It creates this upward spiral of data exchange."**

*Executive director, health data unit*

- **Tie data to a larger mission.** Forrester Research recommends establishing data sharing as a strategic imperative, explicitly calling out data sharing in a data strategy to maintain momentum.[16] As an example of this, data sharing and integration are front and center to the data management policy of the city and county of San Francisco and DataSF, an initiative with the mission to empower the use of data in decision-making and service delivery across San Francisco. The data management policy and DataSF clearly establish data as an asset, and they provide guidance on how to put data to work. That includes a greater emphasis on data sharing and integration, and it explicitly prioritizes interdepartmental data for sharing.

## Data integration agreement

**Roles and responsibilities**

- Data providers - generators or creators of data, licensing it to others
- Data consumers recipient of data for insights or input into products or services
- Sharing facilitator - internal governance body or externa exchange or marketplace

**Rights and requirements**

- Definitions, formats, and quality standards
- Permitted, prohibited, and intended uses
- Data security and privacy
- Regulatory or other requirements and restrictions (e.g., permissions, documentation, and commercialization)

**Business model**

- Period of agreement
- Other terms and conditions
- Subscription or licensing fees potentially including chargeback for internal sharing
- Auditing or review process

Source: Forester Research, Inc. Unauthorized reproduction, citation, or distribution prohibited.

A data agreement formalizes the relationship and establishes terms and conditions, setting expectations mitigating potential risks

Defining rights and requirements ensures transparency and compliance with expectations for the data and its use

Establishing the business model sets expectations for additional terms and conditions including financial and procedural aspects of the relationship

# Analysis Of Benefits

Quantified benefit data as applied to the composite

| Total Benefits | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Ref.** | **Benefit** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Total** | **Present Value** |
| Atr | Process and operational efficiency | $1,934,845 | $3,177,610 | $4,522,003 | $5,503,472 | $5,988,470 | $21,126,400 | $15,259,836 |
| Btr | Accelerated time to value | $369,158 | $531,991 | $647,088 | $768,550 | $827,424 | $3,144,211 | $2,300,122 |
| Ctr | Direct cost savings | $397,800 | $645,575 | $1,021,700 | $1,396,550 | $1,470,925 | $4,932,550 | $3,529,979 |
| Dtr | Improved risk management | $352,000 | $484,000 | $624,000 | $728,000 | $780,000 | $2,968,000 | $2,170,373 |
| | Total benefits (risk-adjusted) | $3,053,803 | $4,839,176 | $6,814,791 | $8,396,572 | $9,066,819 | $32,171,161 | $23,260,310 |

### PROCESS AND OPERATIONAL EFFICIENCY

**Evidence and data.** State and local organizations collect and handle large amounts of data and that the data provides them with widespread opportunities for data utilization, including decision-making and operational monitoring and improvement.[17] However, interviewees said that staff and time constraints often limit the use of data to requirements imposed by the state or federal government. Data aggregation and reporting is frequently conducted just before submission periods and it lacks formal review processes, which leaves outputs prone to errors.

Interviewees noted that one of the biggest day-to-day improvements as a result of their organizations' data integration investments was improving existing data processes and data utilization. Data processes may include any activities where employees work with data (e.g., data entry, aggregation, transfer, analysis, reporting, request fulfillment, and error investigation and remediation). Interviewees said creating and adhering to data labeling, processing, and submission standards along with technological improvements made these data activities more efficient or automated them entirely, which saved employees time and allowed them to better utilize the data they had access to. In some cases, a data integration and management unit took on tasks that local organizations previously ran, which enabled efficiencies of scale. Examples of interviewees' organizations saving time with a data integration initiative include:

- **Automation and efficiency in manual data entry and reporting.** Each interviewee provided examples of employees and constituents dealing with burdensome manual data entry using their organization's previous data system. Even small amounts of time saved by employees added up across local organizations.
    - The executive director of a health data unit noted that stopping a workflow to manually type in data to report on lab conditions used up 15 to 20 minutes thousands of times a day across the state, and that was just one example of many. They said: "It's certainly an interruption in the workflow, and that happens thousands and thousands of times every day … And now do it for all the different kinds of data the state might collect, and it's a non-trivial burden." With its data integration investment, the organization automated the information exchange completely and reduced the

burden on thousands of people who are obligated to send that information to the state. They noted: “It’s a really important value proposition to the state and to the state’s constituents because there’s an opportunity for that to just happen versus it to interrupt their workflow or for them to dedicate a staff member and a whole FTE to just comply with the state requirements.”

**“[There were] three disparate systems [and] five to six people. It would take them three weeks to do it. We knocked that whole process down to an hour-and-a-half, and we saved them over $1.2 million in the scope of a month.”**

*Chief data officer, state data agency*

- The director of research and data analysis at a state education agency estimated that the state saved $330,000 in teacher time just from automating roster verification across 85 districts.
- An interviewee from one state where all educational districts are required to report their benchmark assessment data to the state department of education said the state’s new education data unit offered each district an option for the data unit to aggregate and report the district’s data on its behalf. Ninety-three percent of the districts elected for the data unit to take over the process, which saved them an estimated 10 hours twice a year just with that one report.
- The director of analytics and reporting at a state education agency explained that their organization’s direct integration with the system allowed teachers to see data right within an application they were already using. The interviewee said: “One of our big pushes has been putting the information where people are using it. Don't make them have to open up 16 tabs and copy and paste data all over the place. Let’s get it right into the system.”

**“Every year, at the beginning of school, thousands of family members and school staff used to type info into the system. Now, we can automate that so an immunization in a primary care physician’s office can push all the way through to the immunization registry, and an automated report takes that burden from the school having to collect those from parents. Those kinds of efficiencies are what we do with this automation.”**

*Executive director, health data unit*

- Finally, interviewees said the use of data standards and implementation of automatic data transfers, checks, and alerts drastically improved data quality. Local organizations reduced the time they spent investigating inconsistencies and

correcting errors in their reporting. The director of systems integration at a K12 ESA collaborative said: "Districts spend a lot of time cleaning up data when they do their state reporting. It's a very time-intensive and frustrating process, and if we can eliminate those errors beforehand, then the process goes smoother."

**"We see better data when it's submitted. … When the data come in, it's cleaner data."**

*Director of systems evaluation and technology, state education agency*

- **Efficiency improvements to existing processes.** Interviewees from organizations that invested in data integration and modernization said their agencies also improved a range of existing processes with automation and consolidation. Frequently, a new data unit was able to realize efficiencies of scale by taking on processes that local organizations previously did individually.

  The director of systems integration at a K12 ESA collaborative noted that each district in their state was handling its own integration between a student system and a food service system. The interviewee explained: "It was 450 districts all reinventing it on their own instead of at least taking something that was already created and just deploying it. They were reinventing the wheel."

  These inefficiencies were magnified as things changed and processes and work had to be updated accordingly. The data unit was able to take on that duty across the state, which saved time for employees in each district.

  In another example, an interviewee said their state's department of emergency management typically took five accountants one to three weeks to complete its payroll processes. The state's data integration unit created an automation tool that reduced that time to less than 1.5 hours. The unit estimated it saved that department more than $1 million in just one month.

**"[Exchanging data] allowed us to align our processes a lot easier and a lot better towards one standardized environment where we don't have to have a one-off."**

*Chief data officer, state data agency*

- **Faster data request fulfillment.** Interviewees said state and local organizations are often inundated with data requests from research groups, individuals, or other public or private organizations. The director of analytics and reporting at a state education agency said their organization received 100 data requests from the governor's office, the state House and Senate, and the state department of education the previous year.

  Complying with these requests could be time-intensive because, in addition to delivering data, the organization handled back-and-forth communication with the requesters and with other departments with data needed to fulfil the request. The interviewee said: "[The governor's office, House, Senate, fiscal MDE's, and legislative service] ask us for the data or for

specific data, and we try to clarify to make sure that we're getting them what they need and not what they think they need because those are usually two separate things."

With better data access and standardized data naming and storage, employees could answer requests much more quickly and accurately.

The director of healthcare innovation at a health department estimated that it took 20 to 30 hours to fulfill one request due to data manipulation, aggregation, and checking that the data couldn't be traced to individuals. Their organization created an open data portal on which the public could search for and access data sets to answer their own questions, which saved many requests from ever reaching the health department. The interviewee told Forrester: "We try to get ahead of [the data requests] so we don't have to fulfil the same request [with the] same kind of data over and over. We try and put it at a level of information low enough where people can aggregate it and put things together and do interesting things with it, but at the same time, not too low where it's not confidential anymore [to maintain privacy and security]."

**Modeling and assumptions.** Forrester modeled this benefit for the composite organization based on the following assumptions:

- Forty-eight public organizations joined the data sharing initiative in Year 1. By Year 2, there are 67 participating organizations, and this number increases to 81 by Year 3, 90 by Year 4, and all 95 by Year 5.
- On average, there are four administrative and IT employees at each local organization.
- Prior to joining the data sharing initiative, these IT staff members, administrators, and other employees across the state spent 30% of their time on manual data activities such as data entry, aggregation, reporting, request fulfillment, and error correction.
- After joining the initiative, many of these manual data tasks are automated and save an average of 60% of that time in Year 1, 70% in Year 2, 80% in Year 3, and 85% in Year 4. The increase in time saved grows as the initiative expands its capabilities to deliver additional services.
- Employees recapture 50% of the time saved for added productivity.
- The average hourly fully burdened hourly salary of a public employee is $58 in Year 1, and this increases by 3% each year thereafter.

> **"We had people requesting data constantly, whether it [was] a local health department, a healthcare system, or whatever. We can make an open data set that's aggregated and get that the objective of what somebody's looking for. … We do a weekly automated update, put it up there, [and] share the information."**
>
> *Director of healthcare innovation, health department*

**Risks.** The expected financial impact is subject to risks and variation based on factors including the organization's:

- Breadth of initiative participation and level of change management undertaken to uphold process improvements.

- Amount, type, and efficiency of manual data processes at each organization before participation.
- Data sharing use cases and priorities, including the level of utilization to improve or automate manual processes.
- Compensation amounts for employees and the recapture rates of productivity in saved time.

**Results.** To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a five-year, risk-adjusted total PV (discounted at 10%) of $15.3 million.

**"When we started that first use case, it was aimed at doctors not having to type info into the website but having it come right out of their electronic medical records. Now, we do that for all 1,700 of the pharmacies in the state, as well. So, a use case gets started and gets going, but then it just keeps on expanding so there's more and more folks who benefit from that information."**

*Executive director, health data unit*

**Process And Operational Efficiency**

| Ref. | Metric | Source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|---|
| A1 | Preexisting data-focused, state-level employees | Composite | 6 | 6 | 6 | 6 | 6 |
| A2 | Public organizations that participate in data sharing initiative | Composite | 48 | 67 | 81 | 90 | 95 |
| A3 | Average number of administrative and IT employees at a participating local organization | Composite | 4 | 4 | 4 | 4 | 4 |
| A4 | Percentage of administrative and IT time spent on manual data activities before investment | Interviews | 30% | 30% | 30% | 30% | 30% |
| A5 | Total time participating organizations spent on data activities before investment (hours) | (A1+A2*A3)*2,080 hours*A4 | 123,552 | 170,976 | 205,920 | 228,384 | 240,864 |
| A6 | Percentage of time savings | Interviews | 60% | 70% | 80% | 85% | 85% |
| A7 | Recapture rate on saved time | TEI standard | 50% | 50% | 50% | 50% | 50% |
| A8 | Employee hours recaptured | A5*A6*A7 | 37,066 | 59,842 | 82,368 | 97,063 | 102,367 |
| A9 | Average fully burdened hourly salary of an IT or administrative employee | TEI standard | $58 | $59 | $61 | $63 | $65 |
| At | Process and operational efficiency | A8*A9 | $2,149,828 | $3,530,678 | $5,024,448 | $6,114,969 | $6,653,855 |
| | Risk adjustment | ↓10% | | | | | |
| Atr | Process and operational efficiency (risk-adjusted) | | $1,934,845 | $3,177,610 | $4,522,003 | $5,503,472 | $5,988,470 |
| | **Five-year total: $21,126,400** | | | **Five-year present value: $15,259,836** | | | |

## ACCELERATED TIME TO VALUE

**Evidence and data.** Interviewees shared that investments in data infrastructure, integration, and management increased the speed and agility with which their organizations can respond to changing needs and priorities. In their roles, interviewees are constantly looking to provide new services for their constituents. Changes to federal or state priorities and tracking needs and unanticipated events such as a global pandemic can impose new data and reporting requirements on organizations that collect public data, leading to additional work. When those organizations already have processes and standards in place to facilitate data access, they can make decisions, respond to events or reporting requirements, and deliver services faster. In addition, with data-driven decision-making and the ability to track performance metrics and collect real-time feedback, organizations can reprioritize, adjust their courses of action, and incorporate feedback to improve service delivery on an ongoing basis. Examples of the interviewees' organizations saving time and accelerating their outcomes include:

- **Faster crisis responses.** Interviewees from organizations in the health domain said that when the COVID-19 pandemic required state health organizations to quickly provide new constituent services and take on additional responsibilities, states that already had data transfer and sharing systems in place were much better equipped to meet the public's needs. Having vaccine information readily available benefited providers or states that participated in data integration, and it saved them from having to scramble to access data that existed in silos or was not collected at all.

  The director of healthcare innovation from a health department in the northeast said that for their organization to quickly gather data to respond to other pandemics or threats to public health, it would need to stand up a connected and robust environmental monitoring system that would heavily rely on data integration.

  These types of responses weren't limited to health-related organizations; they crossed public-sector domains. The director of analytics and reporting at a state education agency noted that their state's investment in data integration and modernization helped schools respond to the COVID-19 pandemic more easily. They said, "There was a lot of interest in how many kids were still getting educated during the pandemic, and we were a lot better prepared to answer a lot of those questions than [organizations in] many other states were."

- **More efficient responses to new reporting mandates.** Interviewees gave examples of new mandates for state and local organizations that were triggered by public crises or simply added as part of larger data program at the state or federal level. When a state has already set up data standards and efficient reporting systems, it can quickly comply with new requirements with

> **"Some states did not have that infrastructure, and that was an unmitigated disaster for them. [They needed] to try to figure out where the data [was], where … it [went], … how [to] get it plugged in, [and] how [to] get it aggregated. It was chaos. [But] we were flipping on brand-new labs in a couple of days versus months."**
>
> *Director of healthcare innovation, health data unit*

much less labor. The director of systems integration at a K12 ESA collaborative said, "The state needed to collect benchmark assessment data due to [COVID-19], and we were the only [organization] that could do that."

**"We have a lot more agencies that are coming right to us rather than us having to chase them."**

*Chief data officer, state data agency*

- **Improved launch of new services.** Interviewees from public organizations at all levels said their agencies consistently look to improve and expand their constituent service delivery. They said that with implemented data integration infrastructure and processes, their organizations were better equipped to quickly launch new services because of improved resource allocation and coordination and simplified decision-making.

  The chief data officer and deputy chief data officer at a state data agency said their department occasionally provides local organizations with its own staff to temporarily augment resources and provide expertise that the local organizations might not have. Those resources reduce the necessary training and learning time for local employees and help organizations see results sooner.

  Having the ability to access data from other departments helped employees coordinate services between domains to provide more efficient and effective services. The organizations utilized data from other local agencies or departments to manage care for individuals and to track early program outcomes.

  Oversight or advisory commission served as mechanisms for some organizations to identify and evaluate new initiatives. Having representation from both state- and local-level organizations allowed for early identification, discussion, and evaluation of data needs with input from all relevant parties.

  Finally, the interviewees mentioned that having data infrastructure and standards in place at their organizations and across their states reduced the number of new decisions they needed to make when launching new initiatives. They could build new capabilities or connections onto existing infrastructures and data pathways instead of needing to decide where and how to create new ones.

**"Now, when new things come along, the first thing they ask is, 'Can we run this through the [state data initiative]?'"**

*Director of systems integration, K12 ESA collaborative*

**Modeling and assumptions.** Forrester modeled this benefit for the composite organization based on the following assumptions:

- Participating organizations launch new services or need to comply with new regulations an average of once every four years. The new services and regulations are not cumulative, but the total number of new services or regulations implemented by the participating organizations in each year.
- It takes an average of 4,160 hours of labor to launch a new service or adhere to a new requirement, which is the equivalent of two full-

time equivalent (FTE) employees during one year.

- After joining the initiative, the labor required by participating organizations to deploy new services or to adhere to new requirements is reduced by 30%.
- Employees recapture 50% of the time they save for added productivity.
- The average hourly fully burdened salary of a public employee is $58 in Year 1, and this increases by 3% each year thereafter.

**Risks.** The expected financial impact is subject to risks and variation based on factors including the organization's:

- Quantity of new services launched or new requirements that must be met each year.
- Average labor and time requirements to launch a new service or to adhere to a new requirement.
- Breadth of initiative participation and level of change management undertaken to streamline processes and create efficiencies.
- Amount, type, and efficiency of service delivery and reporting at each organization before participation.
- Data sharing use cases and priorities.
- Compensation amounts for employees and the recapture rates of productivity on saved time.

**Results.** To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a five-year, risk-adjusted total PV of $2.3 million.

**Accelerated Time To Value**

| Ref. | Metric | Source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|---|
| B1 | New services developed by or requirements imposed on participating organizations per year | A2*0.25 | 12 | 17 | 20 | 23 | 24 |
| B2 | Time required to launch a new service or adhere to a new requirement (hours) | Composite | 4,160 | 4,160 | 4,160 | 4,160 | 4,160 |
| B3 | Reduction in required effort | Interviews | 30% | 30% | 30% | 30% | 30% |
| B4 | Recapture rate on saved time | TEI standard | 50% | 50% | 50% | 50% | 50% |
| B5 | Average fully burdened hourly salary of an employee | TEI standard | $58 | $59 | $61 | $63 | $65 |
| Bt | Accelerated time to value | B1*B2*B3*B4*B5 | $434,304 | $625,872 | $761,280 | $904,176 | $973,440 |
| | Risk adjustment | ↓15% | | | | | |
| Btr | Accelerated time to value (risk-adjusted) | | $369,158 | $531,991 | $647,088 | $768,550 | $827,424 |
| | **Five-year total: $3,144,211** | | | **Five-year present value: $2,300,122** | | | |

## DIRECT COST SAVINGS

**Evidence and data.** In addition to saving time, data infrastructure and interoperability investments directly reduced costs for the interviewees' organizations. Depending on the organization's domains and how it uses data, organizations saved money by consolidating systems, reducing reliance on external vendors, minimizing the costs of service provision, or reducing or retiring legacy technology spend and maintenance costs. Specific examples of organizations saving money with data integration included:

- **Vendor consolidation and reduced spend.** Interviewees' organizations reduced their reliance on external vendors through consolidation and with their states' data initiatives taking over the duties. The director of systems evaluation and technology at a state education agency said their state went from 29 student information system (SIS) vendors down to six, and the state saved on contract negotiation and pricing. They said: "We didn't have to do anything. We said, 'Here's the data standard you need to connect to if you're going to kind of work with the districts in our state' … the field gets narrowed down and competition still comes in. … We want vendors to come in with a better mouse trap at a better price according to our standards that you don't charge each district to connect to."
    - One interviewee said their state ran an ROI study on the potential cost savings the state could realize with a data integration investment. The study estimated savings of $7,000 for each software integration a district took on, mostly in labor costs. By the third year of the initiative, the state had completed more than 500 integrations, and this number reached 8,600 by the seventh year.
    - Interviewees described that in addition to vendor consolidation, work done at the local level may also be identified and consolidated by a data unit that has visibility across local organizations. The CEO of an education nonprofit and implementation partner told Forrester: "Some of the big districts have full-on software development shops, and they all spend tons of money building the same applications in every large district. It's so dumb, but that's what we're doing with our tax dollars." Eliminating duplicative work may enable considerable savings across a state.

**"Districts used to have to pay vendors for certain kinds of reports. … That's money that isn't going to the classroom when the state has the data. Because they were largely just taking extracts out of our database files and reformatting it, we took the data that we already had and made it more accessible and added visualization [so] the district wouldn't have to pay for those types of reports."**

*Director of analytics and reporting, state education agency*

    - Even if the volume of work is consistent, consolidating tasks across local organizations to the purview of a state data unit can save local organizations significant costs. The director of analytics and reporting at a state education agency

said, “Our districts were getting charged all over the place for managing the data — and not just the data that the state needed, but also the data that they needed.” The interviewee explained that their organization’s data unit took on this work and drastically reduced the volume of work and thus the amount its districts spent with external vendors.

**“The state’s saving a lot of money from a public-health perspective just by getting all the surveillance information, and [the state] can do [its] job better. [The state] had lots of information flowing in for [it] to take advantage of.”**

*Director of research and data analysis, state education agency*

- **Reduced costs of service provision.** Interviewees from organizations in the health domain said better care coordination through data sharing reduces the costs for Medicaid and other public health service providers by eliminating duplicative testing. The executive director at a health data unit explained that care coordination and medical errors are frequent, and that the opportunities for medication mismatches are significant. They noted a general understanding that in healthcare, everything from runaway costs to runaway government burden to runaway opportunities to take better care of people are well-known and well-documented problems.

  The interviewee told Forrester: “One of the early use cases was getting lab results that people have ordered back to the right provider and getting them looked at, and then also to get it to other specialists or other providers that [a patient] sees so they don’t have to reorder the same test. … As a patient, it’s really frustrating when have a test and then you go to the next doctor, and you get another test that is really similar to the last test you just had. You go, ‘Why couldn’t I just use the test we just did?’ And that applies to imaging for certain MRIs and different kinds of diagnostic tests.”

  Furthermore, the interviewee said that in the long run, a state’s public health sector will save money overall when its constituents receive a higher quality of care.

  Interviewees at the data department that provides augmentative staff to local organizations noted that the department does so at a lower cost than the organization would need to pay if it looked externally. The chief data officer of a state data agency said: “We’ll provide the augmented staffing through us at a discounted rate, and then we do internal service chargebacks for X dollars. It’s better and easier because they’re working as part of our cohesive team on behalf of the agency, so we lower the costs dramatically.”

**“In the Medicaid space, there’s lots of money saved simply because there’s better care-coordination opportunities. Just taking care of people saves money so they don’t consume more unnecessary services.”**

*Executive director, health data unit*

- **Retiring legacy technology.** The interviewees' organizations took advantage of their investments in data integration to modernize their existing data stacks. They used this opportunity to retire old point software and servers that were frequently outdated, difficult to work with, costly to maintain, and underutilized due to a lack of staff expertise with the technology.

  For interviewees who moved from on-premises architecture to the cloud were also able to shift resources from doing database administration to data engineering and analysis, which helps their organizations get more value out of their data. This reduction in maintenance can also help offset the costs of cloud-based architecture.

**"States definitely need to get rid of the big data center in the basement."**

*Executive director, health data unit*

**Modeling and assumptions.** Forrester modeled this benefit for the composite organization based on the following assumptions:

- Prior to participating in the initiative, each organization spent an average of $175,000 annually on external data services or patient care, which totaled $16.6 million across the state.
- After joining, participating organizations reduce this spending by 5% in Year 1, by 6% in Year 2, by 8% in Year 3, and by 10% in years 4 and 5. The reduction in spending increases as the initiative expands its use cases and capabilities to deliver additional services.
- Prior to standing up the data integration and management unit and its associated infrastructure, the composite organization spent $80,000 per year running legacy data infrastructure associated with the domain.
- With the investment in data integration and the move to the cloud, the organization decommissions some of its legacy technology and reduces its total expenditure by 60% in Year 1. By Year 2, its expenditure decreases by 70%, which reaches 85% in Year 3.

**Risks.** The expected financial impact is subject to risks and variation based on factors including the organization's:

- Previous expenditure on external data services, patient care, and data infrastructure, as well as the level of inefficiency or duplicity of that spend.
- Agility in moving data to the cloud and ability to retire legacy data infrastructure.
- Data sharing use cases and priorities.
- Breadth of initiative participation and level of change management undertaken to reduce spending.

**Results.** To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a five-year, risk-adjusted total PV of $3.5 million.

**"It's not like when the state saves a dollar, they put a dollar in their pocket. You take whatever value you save and find a way to deliver it back as value to the districts … it's moving people forward rather than putting money in someone's pocket."**

*Director of research and data analysis, state education agency*

## Direct Cost Savings

| Ref. | Metric | Source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|---|
| C1 | Previous expenditure on external data services or patient care by participating organizations | A2*$175,000 | $8,400,000 | $11,725,000 | $14,175,000 | $15,750,000 | $16,625,000 |
| C2 | Percentage savings with reduced duplicity and unnecessary work | Interviews | 5% | 6% | 8% | 10% | 10% |
| C3 | Subtotal: Savings from reduced expenses | C1*C2 | $420,000 | $703,500 | $1,134,000 | $1,575,000 | $1,662,500 |
| C4 | Cost of running legacy data infrastructure | Composite | $80,000 | $80,000 | $80,000 | $80,000 | $80,000 |
| C5 | Percentage of legacy technology decommissioned | Interviews | 60% | 70% | 85% | 85% | 85% |
| C6 | Subtotal: Savings from retired legacy technology | C4*C5 | $48,000 | $56,000 | $68,000 | $68,000 | $68,000 |
| Ct | Direct cost savings | C3+C6 | $468,000 | $759,500 | $1,202,000 | $1,643,000 | $1,730,500 |
| | Risk adjustment | ↓15% | | | | | |
| Ctr | Direct cost savings (risk-adjusted) | | $397,800 | $645,575 | $1,021,700 | $1,396,550 | $1,470,925 |
| | **Five-year total: $4,932,550** | | | | **Five-year present value: $3,529,979** | | |

### IMPROVED RISK MANAGEMENT

**Evidence and data.** Better data management practices improve security and reduce the likelihood that an organization experiences significant data risk events.[18] Significant risk events could include data breaches or lawsuits, while lesser risk events might include a loss of program funding due to misreported data, data errors and the time associated with fixing them, and poor decisions made with incorrect or insufficient data. There is a significant range in the financial and non-financial consequences that organizations might face from both significant and non-significant risk events. Some examples of the interviewees' organizations reducing their exposure to significant risk events include:

- **Reduced risk of data leaks and breaches.** The director of research and data analysis at a state education agency described a proliferation of insecure data practices in their state's educational districts before their organization's initiative took action. They said: "Districts will email vendors and say, 'Here [are] my five special-ed students who aren't integrating right, and here are their names and their IDs.' Those are clear violations of data. … There was a lot of potential for data security issues."

  Organizations may face legal action and large fines if they fail to protect constituent information in addition to the personal harm that could afflict the impacted parties. With improved data management and updated security practices, an organization can lower its risk of breaches.[19]

- **Avoided lawsuits.** The director of analytics and reporting at a state education agency described that their organization used to be sued by its own districts. They described: "In the early days, there were a lot of lawsuits. Every time we asked for another data element that extended our data collection, we would get sued [by our own districts] for a Headlee Amendment violation, which was unfunded mandate on a local governmental entity. [Now,] we haven't been sued in a while, and it's been very nice."

**"The more you have a handle on who has access to what data sets and what data sets we have, we're able to let folks know these are the data sets available [and] where you store the data. If it's sensitive data, you store it in a more secure area versus data that isn't so sensitive. All these things that we've done over the past three [or] four years and beyond [have] gone into reducing risk."**

*Deputy chief data officer, state data agency*

- **Avoided data errors and poor decisions.** Interviewees said that using data to determine where to focus efforts, how to deliver services, and how to manage risk helps prevent the consequences of ill-informed decision-making. They also noted that improving data quality reduced the time employees spend investigating poor data, correcting data errors, and making updates to other processes accordingly. Organizations with a budget that depends on reported data may lose out on funding if they do not have a way to ensure their data is correct.

  One interviewee said their organization took the following steps to prevent, identify, and correct errors:

  - Providing local organizations with error checks, data alerts, reports and XML

extracts that can be used for submitting data to the state for state reporting.

- Programming a flexible rules engine into the data system so that local data can be checked against the rules, which allows records to be corrected.
- Comparing each district's data files with a file generated from the data system and identifying records that are missing or that do not match.
- Prefixing identification codes to avoid duplicates.

**Modeling and assumptions.** Forrester modeled this benefit for the composite organization based on the following assumptions:

- Prior to joining the data sharing initiative, participating organizations faced an average of one significant data risk incident every six years.
- The average significant data risk incident costs $100,000.
- After joining the data initiative, an organization's chance of facing a significant data risk incident decreases by 55% in years 1 and 2, by 60% in Year 3 and by 65% in years 4 and 5 as data management practices improve.

**Risks.** The expected financial impact is subject to risks and variation based on factors including the organization's:

- Data sharing use cases and priorities.
- Frequency and cost of facing a significant data risk.
- Data sharing, management, and security practices before joining the initiative.
- Breadth of initiative participation and level of change management accomplished.

**Results.** To account for these risks, Forrester adjusted this benefit downward by 20%, yielding a five-year, risk-adjusted total PV of $2.2 million.

**Improved Risk Management**

| Ref. | Metric | Source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|---|
| D1 | Significant data risk incidents at participating organizations | A2*0.16 | 8 | 11 | 13 | 14 | 15 |
| D2 | Average cost of a significant data risk incident | Composite | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 |
| D3 | Reduction in data risk incidents | Interviews | 55% | 55% | 60% | 65% | 65% |
| Dt | Improved risk management | D1*D2*D3 | $440,000 | $605,000 | $780,000 | $910,000 | $975,000 |
| | Risk adjustment | ↓20% | | | | | |
| Dtr | Improved risk management (risk-adjusted) | | $352,000 | $484,000 | $624,000 | $728,000 | $780,000 |
| | **Five-year total: $2,968,000** | | | | **Five-year present value: $2,170,373** | | |

## UNQUANTIFIED BENEFITS

Interviewees mentioned the following benefits that their organizations experienced but were unable to quantify:

- **Value creation through the provision of data-related services.** State data hubs can offer data delivery and integration for authorized entities (e.g., school districts, care providers, or health plans) as a paid service. The executive director of one state's health data unit said their agency charged other public and private organizations for the data services it provided, such as reports or data integration. The interviewee told Forrester: "We charge different groups differently based on the value of the use case or the kind of data sharing that's happening. ... We charge a lab to deliver their lab results to doctors because when doctors order lab tests from their lab, they make money. We don't charge hospitals to send notifications out that patients come to their doorstep, but we do charge health plans and risk-bearing accountable care organizations to receive those alerts because they save money when they do a better job of care coordination."

  This kind of revenue generation was also on the roadmap for the state's education-focused data hub, which planned to charge private vendors that utilized its integration services in the future.

- **Educator time savings.** According to interviewees, teachers benefitted from process automation in addition to IT and data-focused employees. With more efficient processes they reduced the time they spent manually handling student data, like verifying rosters and were freed up to work more directly with students. One interviewee said that in their state, reading-level assessment data automatically flags students who would benefit from reading-improvement plans and even lay out the plan frameworks, which helps teachers identify students' individual needs faster. Principals also use classroom data to help inform and teacher effectiveness evaluations more quickly.

- **Improved decision-making among federal, state, and local decision-makers.** Multiple interviewees mentioned that their organization delivered data dashboards and reports to agencies and organizations to help them track initiative success and inform decision-making. The director of systems evaluation and technology at a state education agency said: "Any decision they're making locally, we hope that improvement in data quality will make [the] decision better. So, any policy decision they may make locally is going to be based on actual data [and] not just a gut [feeling]."

> **"The wait times at the DMV dropped in half since that initiative [started] and [because] we help them pull together their data and their dashboards for the decision-making processes. You go into a [state] DMV now and across most of the localities that DMVs are located, [and] you're looking at 5- or 6-minute wait times."**
>
> *Chief data officer, state data agency*

- **Data-driven program tracking and improvement.** With improved data access, the interviewees said that their organizations started tracking program-outcome metrics across departments and that they were able to make real-time improvements to their services. One

interviewee said their state data agency created a research-based process for schools and districts to assess needs, build learning plans for students, streamline efforts across districts, and leverage funding to improve student outcomes.

- **Greater equity of service provision across local organizations.** Interviewees gave examples of state-level organizations assessing constituent data such as test scores, crime rates, or vaccination rates across local organizations to determine where resources should be best distributed. They can then allocate those resources locally to wherever they are needed most. Additionally, they said having data infrastructure that is more established and automated reduces the manpower and technical expertise needed to utilize data at the local level.

**"Where the feedback from the local health department was constantly incorporated, they could sort of see the outcome and constantly prioritize what they wanted to."**

*Director of healthcare innovation, health department*

- **Facilitated or enabled academic research.** Multiple interviewees told Forrester that their organization used its improved data access to provide other organizations or individuals with aggregated and cross-program data to support research. These organizations were most often university researchers that sometimes collaborated with other groups such as the Educational Policy Innovation Collaborative (EPIC). Having a centralized data management body to make data available and garner permission from local districts helped interviewees' organizations break barriers for researchers to collect the data they needed to improve their effectiveness. The director of analytics and reporting at a state education agency told Forrester: "If the researchers had to go to every single district to ask for information rather than go to one central place, the costs of doing any sort of education research in the state would be astronomical. We've got a wealth of data already at our fingertips and we're able to offer [it] up for studies."
- **Development of applications or standards to be used by other organizations.** A few interviewees described that developing or improving processes, applications, or data standards adds to a repertoire of work that could be picked up and utilized across an entire domain or similar organizations across a state or country. The director of analytics and reporting at a state education agency said, "One of our real big goals in moving to the standards is finding ways to share work with other states."

  **Increased agility and scalability.** Tracking program progress and outcomes across departments and services also helped interviewees' organizations adjust directions or make improvements to services to respond to changing needs. The director of healthcare innovation at a health department noted: "Priorities are constantly shifting. [Having] the ability to have that flexibility to [do] what we need at a particular time that we're not able to predict down the road [is] probably the biggest benefit." They noted that data framework development in one area can expand to additional domains and facilitate statewide initiatives at a lower cost than new development.
- **Improved existing services and student and constituent outcomes.** Data sharing helped the

interviewee's organizations reduce crime, decrease DMV wait times, and improve education strategies, among other benefits. A detailed list of new and improved service delivery can be found in the following section.

**NEW OR ADDITIONAL SERVICES DELIVERED**

The interviewees' organizations delivered additional constituent services due to their investments in data integration. New or additional services in education included:

- **Enhancing security and time savings with single sign-on (SSO) capabilities for educators.** SSO allows districts to 'federate' or connect their local email system and system accounts, so that logging in using one local email and password allows access to a growing range of systems. Adding SSO capabilities to a network of education systems streamlines and secures, access to a wide range of education applications, and saved districts in one state the time and effort spent managing and remembering over 100,000 usernames and passwords.
- **Improving student reading scores with literacy support.** The midwestern education data unit created an online tool to support a new 3rd grade reading requirement. The tool helped identify students that were behind and in need of independent reading improvement plans (IRIPs). After identification, the platform helps educators create, manage, and share IPRPs across districts.
- **Saving time and improving service delivery with the direct certification of students who receive free and reduced-price lunches.** The same state created a service that allows approved systems in a school district to look up the certification of and directly certify students who qualified for a free lunch. With this service, district employees no longer needed to manually search for and download the data, and parents no longer needed to visit a school in person for certification.
- **Better transferring student support with cross-district data transfers.** Another state started a student record exchange that allows districts to look up records on newly enrolling students from their most previously reported district. Before, it could take a week to six months for districts to receive information about a transfer student from when they requested it. Having the information as soon as possible ensures that students are placed in appropriate grades and courses and lets them receive the support they need immediately.
- **Improving student visibility with data dashboards and live reports.** The director of systems evaluation and technology at a state education agency built a portal for students, parents, and teachers to access data on teachers, classes, and students. They said: "Once we went to online testing, we said, "Well, parents and students who never really had access to the results online, they just got a paper report months and months later. We thought people are really going to want to see these data in an online report through the phone or PC."
- **Conducting more efficient background checks for new hires at schools.** The director of analytics and reporting unit explained that their state education agency opened data sharing between the education system and police force in the state, enabling them to automate the background check process for employees who wanted to work near a school. They explained: "When a new educator [or] anyone associated with the school goes through this process, the state police tell us if there's any challenges with [the person] and it goes right to the district, so the district has the information immediately."
- **Lowering student dropout rates with an early-warning identification system.** The midwestern

data unit used attendance, behavior, and course performance data to identify and increase support to students at a high risk of dropping out.

New or additional services in health and human services included:

- **Enhancing care provision with the transfer of medical information across states.** The executive director of a health data unit described an effort to coordinate care across states for populations that traveled seasonally. They said: "We've been able to work with other organizations like us, health information exchanges around the country to share our information. We do that through something called the patient centered data home, so that when people go down to Florida, their data finds their way home back to [our state]."
- **Increasing compliance with newborn screening.** The same executive director of a health data unit explained that: "Newborn screening was supposed to happen but wasn't [before the investment]. There's a lot of things that were supposed to happen, but weren't happening, or people wanted to have happen for a while, but we finally are now able to do."
- **Better responding to pandemics with automated contact tracing.** Along with the benefits of cloud-based architecture, the director of healthcare innovation at a health department credited data integration with enabling the automation of contact tracing in the face of a disease outbreak. Integrating data between departments helped identify individuals who should be contacted, and software updates enabled automation of the process. Previously, a disease investigator would reach out via phone or letter to get ahold of an individual and tell them what to do. Now, there's a system in place to automatically send a letter from a local health department to anyone who tests positive for COVID-19.
- **Improving care coordination for the safety-net population with automatic emergency-room alerts.** The executive director of a health data unit explained that their organization started automatically alerting care providers when individuals with unique medical or social service histories were checked in to emergency rooms across the state. They told Forrester, "A lot of safety net population goes to the emergency department for their primary care. Being able to generate alerts and let folks know that's happening even if it just percolates back to the health plan who may be able to intervene with some additional services allows there to be a more equitable process."

**"Before [the health information network] doctors only knew 37% of the time when their patients had even been to the hospital. Now, everybody who has an active care relationship with a patient can get that information within 2 minutes of them showing up at the door to an emergency department or hospital."**

*Executive director, health data unit*

- **Improving crisis responses with environmental health or communicable-disease surveillance.** The same executive director described that their department started disease surveillance programs that rely on data sharing to better prevent and respond to public health risks like disease outbreaks.

- **Reducing opioid overdoses with access to actionable intelligence.** The deputy chief data officer at a state data agency said their state's focus on data sharing started with an initiative to reduce opioid deaths. They told Forrester: "There was a need to provide statistics, information, [and] actionable intelligence all related to how can we reduce opioid overdoses — particularly as it relates to our young individuals and how we can bring awareness to this. One of the ways [the state] thought [it] could bring awareness and attention in was to understand the data and statistics."

  After raising awareness, the state exchanged data across care providers and the legal system to understand individual behavior, determine the health indicators associated with overdoses, and intervene when necessary. The interviewee said the efforts successfully reduced opioid-related deaths in the counties of focus.

New or additional services in other domains included:

- **Reducing violent crime with law-enforcement-resource optimization.** The chief data officer at a state data agency said their unit coordinated with state police to determine where additional officers were needed and to optimize the resources accordingly. The interviewee said: "[We saw] a downward trend in violent crime in 13 localities because [the localities] know what they're able to invest, and the chief of staff and the governor are able to get the right amount of boots on the ground."
- **Improving veteran identification and outreach.** The same chief data officer said their data agency also helped their state's Department of Veteran Services to understand how many veterans were in the state so it could allocate the right resources to the right people. The interviewee said, "We're working with [the department] to pull in and find every single veteran [who] lives in [our state] so that [the state] can reach out to say, 'You're eligible for these programs' or 'You're not [eligible]' to better serve those folks."
- **Saving time with payroll automation.** The deputy chief data officer at a state data agency said their organization helped its state's Department of Emergency Management reduce the time it spent reconciling payroll with spreadsheets from weeks to less than 2 hours. The interviewee said: "[Previously,] it was a very manual process, so we automated it for [the agency]. … We saved it over $1.2 million in the scope of a month."

**FLEXIBILITY**

The value of flexibility is unique to each customer. There are multiple scenarios in which a customer might invest in data integration and later realize additional uses and business opportunities, including:

- **Consolidating data access for constituents.** The chief data officer at a state data agency mentioned that one of their organization's goal for the next few years is to launch a unified data portal that would serve as a single data resource across state departments and services for all state individuals. They said: "We would like to get a single citizen experience portal so that you can view just about anything that you need to on your own personal [login]. 'Do I need my DMV record?' 'Do I need a fishing license?' 'Do I need a building permit?' Whatever the case may be, [we'll] have it just tied to one single identity."
- **Improving procurement and quality of services.** Interviewees shared that it is common for public sector services and systems to be complicated systems with poor user experiences, and public sector organizations are often locked into their contracts with service providers. They explained that generating additional investment in the space and being more selective about vendors will spur competition and better equip

organizations to procure best-in-class services and negotiate pricing.

The CEO at an education nonprofit and implementation partner described: "Imagine you had a fully inoperable K-12 data ecosystem. What does it mean for the rest of public data? If we had this, as we build this out, it will become more common for us to actually build citywide or statewide social support systems that don't cost ridiculous amounts of money."

- **Using a network effect that supports technology standards, expertise, and support.** According to interviewees, as more public-sector employees are exposed to modern tools and technologies, the expertise of the whole labor pool will increase and there will be more resources to educate and train organizations new to data integration. They also projected that more organizations using the technology and relying on it will incentivize and guarantee future funding for the technology to be maintained and that tools and standards will improve with new iterations and learnings. The director of analytics and reporting at a state education agency explained: "The more states that move to the standards and start leveraging the standards on their internal builds of the processes, it's going to be so important for other states to leverage. … Building physical implementations of the standard is one of our primary activities right now."
- **Having access to open-source applications and code.** The CEO at an education nonprofit and implementation partner noted that their agency works with public organizations to build applications that can be used across various areas of need. The director of analytics and reporting at a state education agency said: "Ideally, we'd be able to share the code for the whole site, and some other state would be able to pick up my school data and [see] it was school data or whatever and be able to show the same displays on top of [its] data model similarly structured, but with their own state's data in it."
- **Using advanced data analytics and AI or machine learning (ML) applications**. With an integrated approach to their data usage, interviewee's organizations looked to undertake additional data analyses and apply predictive algorithms to further improve planning. The chief data officer at a state data agency said: "Now, we're looking at predictive models on our platform to base 10 years' worth of historical data. What models can we put together so that they can predict where future funding may be needed based on past circumstances?"
- **Strengthening public trust.** Interviewees said improving data management and security practices as well as transparency around data collection and access can instill trust and improve constituent confidence in public organizations.

Flexibility would also be quantified when evaluated as part of a specific project (described in more detail in Appendix A).

> **"If this infrastructure were everywhere, you can imagine that any application that any public agency creates that's built on that could be used by any other public agency in the country for free. We could start to invest in local data and software applications that then can be deployed anywhere. It's a huge positive externality that we have not yet explored."**
>
> *CEO, education nonprofit and implementation partner*

# Analysis Of Costs

Quantified cost data as applied to the composite

| Total Costs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Ref.** | **Cost** | **Initial** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Total** | **Present Value** |
| Etr | External costs | $935,000 | $440,000 | $550,000 | $660,000 | $797,500 | $935,000 | $4,317,500 | $3,410,678 |
| Ftr | Data integration and management unit labor | $1,584,000 | $1,242,000 | $1,705,680 | $2,196,063 | $2,563,533 | $2,795,763 | $12,087,039 | $9,259,555 |
| Gtr | Planning, oversight, and organizational labor | $253,000 | $2,706,000 | $1,078,990 | $805,010 | $531,060 | $312,142 | $5,686,202 | $4,766,080 |
| | Total costs (risk-adjusted) | $2,772,000 | $4,388,000 | $3,334,670 | $3,661,073 | $3,892,093 | $4,042,904 | $22,090,740 | $17,436,313 |

### EXTERNAL COSTS

**Evidence and data.** The interviewees' organizations paid for data infrastructure or licensing either directly or through an implementation partner. The interviewees' organizations paid vendors implementation fees to launch new systems, train employees in the new architecture, and ensure all end users and external agencies are successfully connected to the system. These technical partners might be a large infrastructure and SaaS provider (e.g., AWS), a private software and services or consulting partner or nonprofit that specializes in the public sector.

Organizations may be charged separately for ongoing system maintenance, new interfaces, and data procedures to enhance or redesign processes, new application development, or other services and that these costs extend on an ongoing basis beyond the initial implementation period. Initial infrastructure costs may include the costs of standing up new databases, data warehouses, or centralized or localized operational data stores (ODS). Localized data storage and management gives local organizations more autonomy, while centralized management streamlines management and may create cost efficiencies.

The chief data officer at a state data agency noted that their organization paid roughly the same amount with its cloud infrastructure than it did before the data integration initiative. They told Forrester: "We are dealing with a lot more data now than we were back then with separate machines. So, having a break-even point [in costs] with an increase in data is a win-win for us."

> **"We were able to move so much faster than if we had to make changes in a data center and tried to do this in-house."**
>
> *Senior director of outreach and communication, health data unit*

**Modeling and assumptions.** Forrester modeled this cost for the composite organization based on the following assumptions:

- The state hires the first employee for a new data integration and management unit at the start of the implementation period. That unit grows and spends three years on implementation before a go-live date at the start of Year 1 when the unit invites organizations to join its data system.
- The composite organization works with an external vendor to help with implementation, and it spends $750,000 on the vendor, data infrastructure, and licensing during the three-year implementation period.
- Expenditure on the external vendor, data infrastructure, and licensing decreases to $350,000 in Year 1 after initial implementation is complete, but it grows after Year 1 as the unit manages more data and provides additional services.
- The composite also faces legal fees, insurance, and rent costs totaling $600,000 over the three-year implementation period and the modeled five years of operation.

**Risks.** The expected financial impact is subject to risks and variation based on factors including the organization's:

- Scope of work of the data sharing initiative and the extent and types of desired data infrastructure and licensing.
- Speed of implementation and growth.
- Extent of desired partnership with an external implementation vendor.
- Legal, insurance, and space needs.

**Results.** To account for these risks, Forrester adjusted this cost upward by 10%, yielding a five-year, risk-adjusted total PV (discounted at 10%) of $3.4 million.

**External Costs**

| Ref. | Metric | Source | Initial | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|---|---|
| E1 | Expenditure on implementation vendor, data infrastructure, and licensing | Interviews | $750,000 | $350,000 | $425,000 | $500,000 | $600,000 | $700,000 |
| E2 | Expenditure on legal fees, insurance, and rent | Interviews | $100,000 | $50,000 | $75,000 | $100,000 | $125,000 | $150,000 |
| Et | External costs | E1+E2 | $850,000 | $400,000 | $500,000 | $600,000 | $725,000 | $850,000 |
| | Risk adjustment | ↑10% | | | | | | |
| Etr | External costs (risk-adjusted) | | $935,000 | $440,000 | $550,000 | $660,000 | $797,500 | $935,000 |
| | **Five-year total: $4,317,500** | | | **Five-year present value: $3,410,678** | | | | |

### DATA INTEGRATION AND MANAGEMENT UNIT LABOR

**Evidence and data.** Each interviewee said their state government set up a new department or unit that managed the state's work with data integration from infrastructure procurement to operations and management to reporting and communication between stakeholders and participants. The staff of these organizations often grew quickly during the first years of the initiative and ultimately ranged from five FTE (full time equivalent) employees to more than 60 FTE employees.

- The executive director of a health data unit explained that during the formation of their agency's data unit, it had to handle legal, data, and technology integration processes concurrently. Several other interviewees described the early work of their agency's data unit as remapping existing data to a new system, defining a data standard, organizing the data governance and operations environment, building out the data ingestion process, creating reports and dashboards, and working on contracts and vendor negotiation. The chief data officer at a state data agency noted that the first few years of their organization's data integration were full of agency outreach and creating a presentation layer for agencies and organizations to use to make decisions.
- Interviewees reported that once local organizations began to join their state's data integration initiatives, state-level representatives worked closely with them to help with change management and to ensure they would properly and securely integrate and manage their integrations or own data storage. The deputy chief data officer at a state data agency said their agency's data organization helped smaller agencies or organizations mature their processes and sometimes placed staff with them to guide them.
- While interviewees noted that while smaller organizations or agencies tended to need more handholding than larger ones, all local organizations could move further along in their own maturity processes. Occasionally, larger organizations in their states help train and advise smaller ones. This training often included webinars, online courses, documentation, and — in some cases — a physical presence.

> **"We've got our train-the-trainer network, and we've got a number of intermediate school districts [that] really help us with our professional development, local professional development for training district personnel [and] teachers, how to use data effectively, and how to use school data itself effectively."**
>
> *Director of analytics and reporting, state education agency*

- Interviewees also described that training helped local organizations understand how to benefit from their participation. The director of analytics and reporting at a state education agency told Forrester: "There's a whole training program around utility and how to use that to better improve your curriculum and your instruction in your school district and really understand the outcomes from making changes."

**Modeling and assumptions.** Forrester modeled this cost for the composite organization based on the following assumptions:

- The composite hires two FTE employees in Year 1 of the initial period to set up the data

management unit. Hiring these employees is part of existing resources' standard duties.

- The full-time staff expands to four employees in Year 2 and to six in Year 3 of the initial period. (See Appendix C).
- The average fully burdened hourly salary of a public employee is $58 in Year 1, and this increases by 3% each year thereafter.
- During Year 1 of full operation, the unit employs nine FTE employees, and this number increases to 18 in Year 5.

**Risks.** The expected financial impact is subject to risks and variation based on factors including the organization's:

- Data sharing use cases and priorities.
- Speed of implementation and growth.
- Number of FTE employees needed to operate the data integration and management unit.
- Compensation amounts and structures for employees.

**Results.** To account for these risks, Forrester adjusted this cost upward by 15%, yielding a five-year, risk-adjusted total PV of $9.3 million.

**Data integration And Management Unit Labor**

| Ref. | Metric | Source | Initial | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|---|---|
| F1 | FTE employees who work for data integration and management unit | Composite | 12 | 9 | 12 | 15 | 17 | 18 |
| F2 | Average fully burdened annual salary of a data integration and management unit employee | TEI standard | $120,000 | $120,000 | $123,600 | $127,308 | $131,127 | $135,061 |
| Ft | Data integration and management unit labor | F1*F2 | $1,440,000 | $1,080,000 | $1,483,200 | $1,909,620 | $2,229,159 | $2,431,098 |
| | Risk adjustment | ↑15% | | | | | | |
| Ftr | Data integration and management unit labor (risk-adjusted) | | $1,656,000 | $1,242,000 | $1,705,680 | $2,196,063 | $2,563,533 | $2,795,763 |
| | **Five-year total: $12,159,039** | | | | **Five-year present value: $9,259,555** | | | |

## PLANNING, OVERSIGHT, AND ORGANIZATIONAL LABOR

**Evidence and data.** Existing state-level employees at the interviewee's organizations invested some time to support the data initiative. This support included time spent planning the investment and execution, distributing funding, supporting initial setup of a data integration and management unit, and providing oversight and advice to the unit.

Interviewees also described variation in labor depending on funding type or source. One interviewee said their state funded its data initiative with a federal grant and that a state employee managed the grant allocation and distribution. Other states might spend additional time communicating with their state legislature to secure funding, and a new data unit also relies on existing employees to search for and hire its first employee. Oversight of the data unit is usually provided by a few existing state employees who join an advisory body that meets regularly to discuss the strategy, budget, and operations of the data unit.

Interviewees also reported that employees at local organizations also invest their own time when joining a new data system, both from a technological and change-management perspective. Though the data unit might help guide local organizations through the process, employees need to spend time learning about the new data standards and systems they will work with. They may also need to convince any local stakeholders of the value of participation or show other employees or constituents (e.g., teachers, care providers) how to use the data systems.

**Modeling and assumptions.** Forrester modeled this cost for the composite organization based on the following assumptions:

- 1.5 FTE employees work on planning, data integration, management-unit setup, and oversight during the three-year initial period.
- After the initial period, the required labor drops to 0.5 FTE employees in Year 1 and then to 0.25 FTE employees from Year 2 on.
- The average fully burdened hourly rate of a public employee is $58 in Year 1, and this increases by 3% each year thereafter.
- Forty-eight public organizations join the data initiative in Year 1, 19 join in Year 2, 14 join in Year 3, nine join in Year 4, and the last five in that domain join in Year 5.
- The average cost for each organization to join the initiative is $50,000, and this includes integration, change management, and training.

**Risks.** The expected financial impact is subject to risks and variation based on factors including the organization's:

- Speed of implementation and growth.
- Number of FTE employees needed for planning, data integration, management unit setup, and oversight.
- Number of local organizations that will join the data sharing initiative.
- Expected costs of training, implementation, and change management.
- Number of FTE employees needed to operate the data integration and management unit.
- Compensation amounts and structures for employees.

**Results.** To account for these risks, Forrester adjusted this cost upward by 10%, yielding a five-year, risk-adjusted total PV of $4.8 million.

| Planning, Oversight, And Organizational Labor | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Ref.** | **Metric** | **Source** | **Initial** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| G1 | FTE employees who conduct planning, data integration and management unit setup, and oversight | Interviews | 1.50 | 0.50 | 0.25 | 0.25 | 0.25 | 0.25 |
| G2 | Fully burdened annual salary of a state planning and oversight employee | TEI standard | $120,000 | $120,000 | $123,600 | $127,308 | $131,127 | $135,061 |
| G3 | New public organizations that join the data sharing initiative | Composite | 1 | 48 | 19 | 14 | 9 | 5 |
| G4 | Expected costs of training, implementation, and change management per organization | Composite | $50,000 | $50,000 | $50,000 | $50,000 | $50,000 | $50,000 |
| Gt | Planning, oversight, and organizational labor | G1*G2+G3*G4 | $230,000 | $2,460,000 | $980,900 | $731,827 | $482,782 | $283,765 |
| | Risk adjustment | ↑10% | □ | | | | | |
| Gtr | Planning, oversight, and organizational labor (risk-adjusted) | | $253,000 | $2,706,000 | $1,078,990 | $805,010 | $531,060 | $312,142 |
| | **Five-year total: $5,686,201** | | | | **Five-year present value: $4,766,080** | | | |

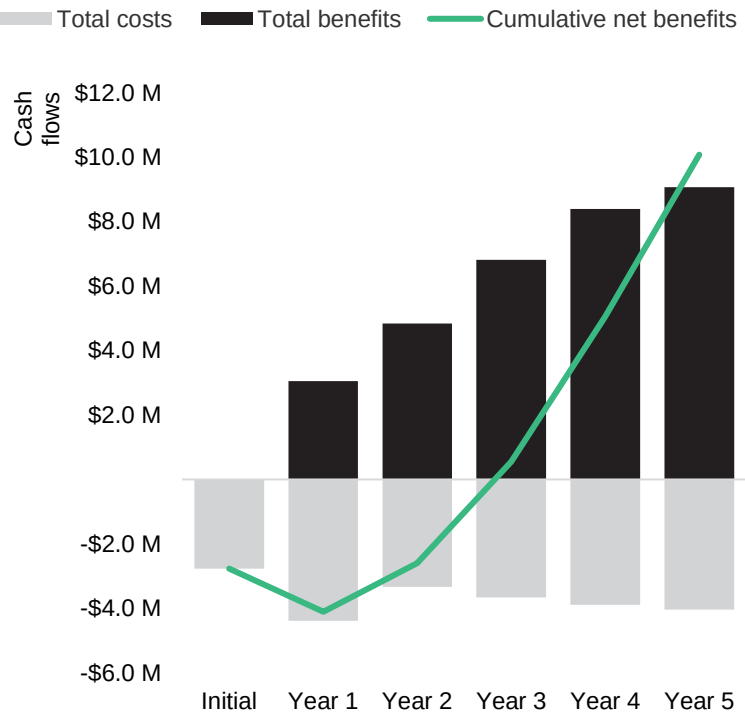
**We've had so many things come along where people are like, 'Well, can we do this through the [initiative]?' And the answer almost always has been yes.**

— Director of systems integration, K12 ESA collaborative

# Financial Summary

## CONSOLIDATED FIVE-YEAR RISK-ADJUSTED METRICS

### Cash Flow Chart (Risk-Adjusted)




The financial results calculated in the Benefits and Costs sections can be used to determine the ROI, NPV, and payback period for the composite organization's investment. Forrester assumes a yearly discount rate of 10% for this analysis.

**These risk-adjusted ROI, NPV, and payback period values are determined by applying risk-adjustment factors to the unadjusted results in each Benefit and Cost section.**

**Cash Flow Analysis (Risk-Adjusted Estimates)**

| | Initial | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total | Present Value |
|---|---|---|---|---|---|---|---|---|
| Total costs | ($2,772,000) | ($4,388,000) | ($3,334,670) | ($3,661,073) | ($3,892,093) | ($4,042,904) | ($22,090,740) | ($17,436,313) |
| Total benefits | $0 | $3,053,803 | $4,839,176 | $6,814,791 | $8,396,572 | $9,066,819 | $32,171,161 | $23,260,310 |
| Net benefits | ($2,772,000) | ($1,334,197) | $1,504,506 | $3,153,718 | $4,504,479 | $5,023,915 | $10,080,421 | $5,823,997 |
| ROI | | | | | | | | 33% |
| Payback | | | | | | | | 34.0 months |

# Appendix A: Total Economic Impact

Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

### TOTAL ECONOMIC IMPACT APPROACH

**Benefits** represent the value delivered to the business by the product. The TEI methodology places equal weight on the measure of benefits and the measure of costs, allowing for a full examination of the effect of the technology on the entire organization.

**Costs** consider all expenses necessary to deliver the proposed value, or benefits, of the product. The cost category within TEI captures incremental costs over the existing environment for ongoing costs associated with the solution.

**Flexibility** represents the strategic value that can be obtained for some future additional investment building on top of the initial investment already made. Having the ability to capture that benefit has a PV that can be estimated.

**Risks** measure the uncertainty of benefit and cost estimates given: 1) the likelihood that estimates will meet original projections and 2) the likelihood that estimates will be tracked over time. TEI risk factors are based on "triangular distribution."

The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1 that are not discounted. All other cash flows are discounted using the discount rate at the end of the year. PV calculations are calculated for each total cost and benefit estimate. NPV calculations in the summary tables are the sum of the initial investment and the discounted cash flows in each year. Sums and present value calculations of the Total Benefits, Total Costs, and Cash Flow tables may not exactly add up, as some rounding may occur.

### PRESENT VALUE (PV)

The present or current value of (discounted) cost and benefit estimates given at an interest rate (the discount rate). The PV of costs and benefits feed into the total NPV of cash flows.

### NET PRESENT VALUE (NPV)

The present or current value of (discounted) future net cash flows given an interest rate (the discount rate). A positive project NPV normally indicates that the investment should be made unless other projects have higher NPVs.

### RETURN ON INVESTMENT (ROI)

A project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits less costs) by costs.

### DISCOUNT RATE

The interest rate used in cash flow analysis to take into account the time value of money. Organizations typically use discount rates between 8% and 16%.

### PAYBACK PERIOD

The breakeven point for an investment. This is the point in time at which net benefits (benefits minus costs) equal initial investment or cost.

# Appendix B: Glossary Of Terms

Data exchange: Primarily the one- or two-way electronic sharing of individual or aggregated PII with a government or private entity. Source: "Data Exchange," Social Security Administration

Data sharing: The practice of providing partners with access to information that they can't access in their own data systems. Source: "Introduction to Data Sharing," Actionable Intelligence for Social Policy, University of Pennsylvania

Data integration: A type of data sharing that involves record linkage, which is the joining or merging of data based on common data fields such as name, social security number, or an encrypted "unique ID" that is used to link or join records at the individual level. Source: "Introduction to Data Sharing," Actionable Intelligence for Social Policy, University of Pennsylvania

Domain: A specific area of focus within the public sector (e.g., emergency management, education, health and human services). This term is defined as such for the purpose of this study only.

Data unit: An organization that manages data infrastructure, governance and access, integration, and use. This term is defined as such for the purpose of this study only.

Significant risk event: A risk event that costs an organization more than $100,000 (e.g., significant data breach or lawsuit). This term is defined as such for the purpose of this study only.

Lesser risk event: A risk event that costs an organization less than $100,000 (e.g., small data leak or error). This term is defined as such for the purpose of this study only.

Interoperability: The ways in which data is formatted to allow for diverse datasets to be merged or aggregated in meaningful ways. Source: "Data Interoperability," National Library of Medicine

Data structure: An organization of information for better algorithm efficiency, such as queue, stack, linked list, heap, dictionary, and tree, or conceptual unity, such as the name and address of a person. It may include redundant information, such as length of the list or number of nodes in a subtree. Source: Paul E. Black, "data structure," in *Dictionary of Algorithms and Data Structures*, December 15, 2004

# Appendix C: Initial Period Cost For Data Integration And Management Unit Labor

| Initial Period Cost | | | | | |
|---|---|---|---|---|---|
| **Ref.** | **Metric** | **Source** | **Year 1 (Initial)** | **Year 2 (Initial)** | **Year 3 (Initial)** |
| R1 | FTE employees who work for data integration and management unit | Composite | 2 | 4 | 6 |
| R2 | Average fully burdened data integration annual salary of a management unit employee | TEI standard | $120,000 | $120,000 | $120,000 |
| Rt | data integration and management-unit initial period costs | R1*R2 | $240,000 | $480,000 | $720,000 |
| | **Five-year total: $146,250** | | | | |

# Appendix D: Supplemental Material

*Online Resources*


Nir Menachemi, Saurabh Rahurkar, Christopher A. Harle, Joshua R. Vest, "The benefits of health information exchange: an updated systematic review," *Journal of the American Medical Informatics Association*, Volume 25, Issue 9, Oxford University Press, September 2018

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"Digital Government: Building a 21st Century Platform to Better Serve the American People," US Obama White House Archives, March 2012

"Data Sharing Success Stories," California Department of Education, July 12, 2022

"Data Sharing Road Map: Improving Student Outcomes through Partnerships between Public Housing Agencies and School Districts," US Department of Housing and Urban Development, January 2017

"National Strategy to Advance Privacy-Preserving Data Sharing and Analytics," US National Science And Technology Council, March 2023


# Appendix E: Endnotes

[1] Source: "The Key To Insights-Driven Decisions Is Curiosity Velocity," Forrester Research, Inc., March 8, 2023.
[1] Ibid.

[2] Source: "Chief Data Officers: Invest In Your Data Sharing Programs Now," Forrester Research, Inc., March 11, 2021.

[3] Ibid.

[4] Source: "Data Exchange," Social Security Administration.

[5] Source: "Introduction to Data Sharing," Actionable Intelligence for Social Policy, University of Pennsylvania.

[6] Source: "Predictions 2023: Public Sector," Forrester Research, Inc., November 2, 2022.

[7] Source: "Chief Data Officers: Invest In Your Data Sharing Programs Now," Forrester Research, Inc., March 11, 2021.

[8] Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

[9] Source: "10 research questions interoperability will radically transform." Andrew Rice, Education Analytics, June 7, 2023.

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[12] Source: "Trusted Data Sharing: A Modern Framework For Empowering Individuals And Organizations," Forrester Research, Inc., September 6, 2022.

[13] Source: "Chief Data Officers: Invest In Your Data Sharing Programs Now," Forrester Research, Inc., March 11, 2021.

[14] Source: "Importance of Documentation," U.S. Department of Health and Human Services, Office of Inspector General, January 30, 2012.

[15] Source: "Chief Data Officers: Invest In Your Data Sharing Programs Now," Forrester Research, Inc., March 11, 2021.

[16] Ibid.

[17] Source: The U.S. Government's Open Data, U.S. General Services Administration, 2023.

[18] Source: "NIST Privacy Framework: A Tool For Improving Privacy Through Enterprise Risk Management," U.S Department of Commerce, January 16, 2020.

[19] Source: "Protecting Personal Information: A Guide for Business," U.S. Federal Trade Commission, October 2016.


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