

CHAPTER 9

Creating Data Infrastructures for Government Analytics

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SUMMARY

Creating the conditions for effective data analytics in the public sector requires reforming management information systems (MIS). This chapter outlines a road map to guide practitioners in the development of analytically driven information systems, drawing on the experience of World Bank practitioners and government officials. The conceptual framework and cases presented focus on human resources management information systems (HRMIS), foundational data infrastructures that provide information on personnel and compensation. However, the chapter articulates broader lessons for designing and managing information systems for government analytics. The chapter first discusses the stages in reforming an HRMIS, outlining key decision points and trade-offs involved in building public sector data architectures. It then demonstrates how this framework can be applied in practice and the associated risks, drawing on case studies of analytical transformations of HRMIS in Luxembourg, Brazil, and the United States.

ANALYTICS IN PRACTICE

- Many government information systems, such as human resources management information systems (HRMIS), can be thought of in terms of the interaction of distinct data modules. Thinking about data within these “islands” of like data allows the analyst to define more precisely the reforms such modules might need and identify interdependencies between them. For example, an HRMIS can be thought of as multiple modules, including payroll and personnel data, that interact to provide insights any single type of data could not. As a result, reforms must be precise regarding which modules will be modified and why. The implementation team needs to be aware of how modules depend on one another in order to understand how the flow of data within the information system might disrupt the use and interpretation of other modules in the system.

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- HRMIS data modules are not created equal: rather, some provide the foundation upon which all other systems rely. Reforms should prioritize the comprehensiveness and quality of foundational modules in human resource management and then transition to developing more complex analytical modules. In HRMIS reforms, foundational modules—including payroll compliance and basic personnel information—should take precedence over other layers, such as talent management and analytics. Without a quality foundation, other modules will produce imprecise or inaccurate analytics. Analytical modules, including dashboards and reports, require that foundational modules be set in place and that their data be accurate.
- However, almost any government data system that has prioritized accurate measurement can be useful. Thus, small reforms targeted at strengthening basic data quality can generate analytical insights even when other foundational modules need further reform. Most developing countries are in the process of building foundational HRMIS modules, such as payroll or basic information on HR headcount. Accurate measurement of these data can be useful. Even if these foundational modules are incomplete in terms of the wider vision of the implementation team, it is still possible to develop analytics reports from foundational modules, such as wage bill analysis and sectorwise employment. Analytical reports can be produced, even if manually, without implementing an analytics module. Though data analysis and visualization might be narrow in scope, this approach can provide quicker results and build even greater political will for further reform.
- HRMIS reform processes should be informed by the policy objectives of practitioners, such as improving the budgetary compliance of the wage bill. This facilitates political commitment to HRMIS reforms and ensures their policy relevance, although institutional coordination should be secured as well. HRMIS reforms should be anchored in problems the government considers policy priorities to secure commitment from political leadership. These problems typically include wage bill controls, identifying ghost workers, and providing analytics for decision-making about workforce composition and planning. Since HRMIS reforms are often cross-cutting, institutional coordination among the various government agencies involved in public administration is critical. An institutional mandate and the inclusion of key stakeholders may facilitate this effort.
- The reform process should sequentially strengthen the maturity of the wider system, with defined stages guiding the implementation process. A sequential approach to HRMIS reforms is illustrated in the figures throughout this chapter. They imply the preparation of a rollout strategy—however limited—that plans for the political obstacles ahead and considers the constraints of the existing legal framework. Implementation requires both repeated testing of the solution and creating accessible technical support for users of the HRMIS. Finally, monitoring the reform includes credibly shutting down legacy systems and tracking the use of new solutions.
- A gradual and flexible approach can enhance the sustainability and future development of the HRMIS, due to unexpected data coverage and quality issues. Because HRMIS and other public sector data systems are so complex, unexpected challenges may arise along the way. Data coverage may be incomplete, requiring that additional information be integrated from other modules. Data quality may also be compromised because incorrect human resources (HR) records may be widespread. Therefore, reform teams should build contingency plans from the start, make choices that provide them with multiple options, and be ready to adapt their plan even during the implementation phase.
- The design of the reform should carefully consider the trade-offs involved in choosing different specifications. Design choices have different implications for reform, regarding both the breadth of the reform and its sustainability. For instance, outsourcing the solution to private firms for the implementation of HRMIS reforms may reduce the need to build in-house capacity to develop the software and accelerate the reform timeline, but this choice may still require building capacity for maintenance in the long run. Building internal capacity and managing these operational trade-offs is at the heart of a public service that is most likely to capitalize on technological progress.

INTRODUCTION

The *World Development Report 2021* (World Bank 2021b) outlines the potential for data to improve developmental outcomes. However, as the report highlights, the creative potential of data can only be tapped by embedding data in systems, particularly information systems, that produce value from them. In other words, data must be harnessed into public intent data, defined as “data collected with the intent of serving the public good by informing the design, execution, monitoring, and evaluation of public policy” (World Bank 2021b, 54).

For data to serve this purpose, robust data infrastructures are necessary. Governments across the world collect vast amounts of data, particularly through statistical offices—when gathering information on society—and through the internal use of management information systems (MIS) (Bozeman and Bretschneider 1986).¹ These forms of data infrastructure are used to generate measures in multiple policy domains described elsewhere in *The Government Analytics Handbook*: from budget planning (chapter 11) to customs (chapter 14) and public procurement (chapter 12). Government-owned data infrastructure can generate data analytics to support policy making through the application of statistical techniques (Runkler 2020).

However, data infrastructures that provide analytical insights are still at various levels of maturity in the public sector in general and developing countries in particular. A 2016 report highlights that governments only explore 10–20 percent of the potential value of analytics, in contrast to 40–50 percent in private sector retail (Henke et al. 2016). Multiple factors account for the relative underdevelopment of analytics in public administration. In contrast to the private sector, governments respond to multidimensional demands and diverse stakeholders (Newcomer and Caudle 1991). Siloed and legacy systems inhibit data integration and analytics pipelines (Caudle, Gorr, and Newcomer 1991).

Promoting the use of data analytics in the public sector requires a combination of both technological innovation and organizational change, the analog complements to data analytics (World Bank 2016). In particular, the development of data analytics within the public sector requires a coordinated effort to both transform how data are stored and analyzed and embed these analytical insights into the decision-making processes of public sector agencies. These reforms are often part of a larger digitalization strategy (World Bank 2021a). It is these reforms in data infrastructure that make possible the use of data analytics in the public sector, often led by a public sector reform team.

This chapter provides a road map to the implementation of analytically driven data infrastructures in the public sector, drawing on the experiences of World Bank practitioners and government officials across the world. The substantive focus is on human resources management information systems (HRMIS), a core function within public administration.² The conceptual framework outlined provides a foundational perspective on data analytics in the public sector, exploring the established domain of human resource management to illustrate key design decisions in the transformation of data infrastructure into analytics. However, the road map described in this chapter is generalizable to a variety of settings, and throughout the chapter, we emphasize its adaptability to other settings.

The conceptual framework is divided into two parts. The first section provides a typology of the modules that comprise an HRMIS, describing both their content and how they relate to one another. The emphasis is on the distinction between foundational and analytics modules—in particular, how the foundational modules feed into analytical products. Equipped with conceptual clarity about the structure of the information system, we move on to the operational framework for HRMIS reforms. This section describes in detail a framework for HRMIS reforms, outlining a sequential approach to reform (Diamond 2013). The operational framework describes the different stages in HRMIS implementation, their requirements, and best practices for each.

After laying out this conceptual framework, the chapter focuses on a set of case studies to illustrate how it can be applied in practice. Luxembourg showcases the development of a human resources business intelligence competency center (HR BICC), an intricate dashboard that has revolutionized how HR analytics are conducted. The case of Brazil describes how a machine-learning-empowered fraud detection system reduced

costs and improved the efficiency of an audit team responsible for overseeing the federal government payroll. Finally, the case of the United States highlights the experience of a team in the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) that developed a dashboard enabling the fast and intuitive use of employee engagement surveys for policy making.

We recognize that these cases are drawn primarily from developed countries (the United States and Luxembourg) and a developing country with a relatively mature HRMIS (Brazil). Practitioners should be aware that while the lessons are generalizable to contexts in which MIS may be less mature, the challenges faced may differ. For instance, in each of these cases, an HRMIS was already in place with foundational modules to use in analytical transformation. This may not be the case in countries where the foundational modules have not been set in place. As a result, while a similar operational framework may be deployed, the types of products (analytical or foundational) may differ substantially. Having said this, we believe these cases illustrate general principles that are useful for all practitioners interested in applying an operational framework for HRMIS reforms. Each case study is described in greater detail in case studies 9.1–9.3 of the *Handbook*.

A set of practical lessons emerge from the conceptual framework and case studies. First, a modular approach to HRMIS reforms enables a precise definition of the reform's scope and how the intervention will affect the broader data ecosystem. Reform teams should consider available resources when deciding which modules to target for reform, as well as how data flow across modules. Second, foundational modules, which focus on payroll, personnel management, and position management, should take precedence over analytical layers, in large part because analytics requires well-structured data records. Nevertheless, analytical layers can be designed for specific modules within an HRMIS if their scopes are sufficiently narrow and well defined. In general, a sequential and flexible approach to data infrastructure reform is recommended. An *ex ante* assessment of key issues in human resource and wage bill management (both in terms of their likelihood and the severity of their impact on the system as a whole) will enable governments to hedge risks to their initial design.

Finally, the implementation of data infrastructure reforms needs to navigate political-economic issues and ensure leadership commitment and institutional coordination among agencies. To do so, it helps to anchor measurement and analytical outputs in problems the government considers priorities to address. In an HRMIS, these are typically wage bill controls, analytics for personnel decision-making, and workforce planning. Coordination can be facilitated by including key stakeholders and clarifying institutional mandates over data collection and processing. On a more technical note, capacity issues should be considered before and during implementation. Governments often implement large-scale data infrastructure reforms for the first time and may require external assistance from experts who have engaged in similar reforms before.

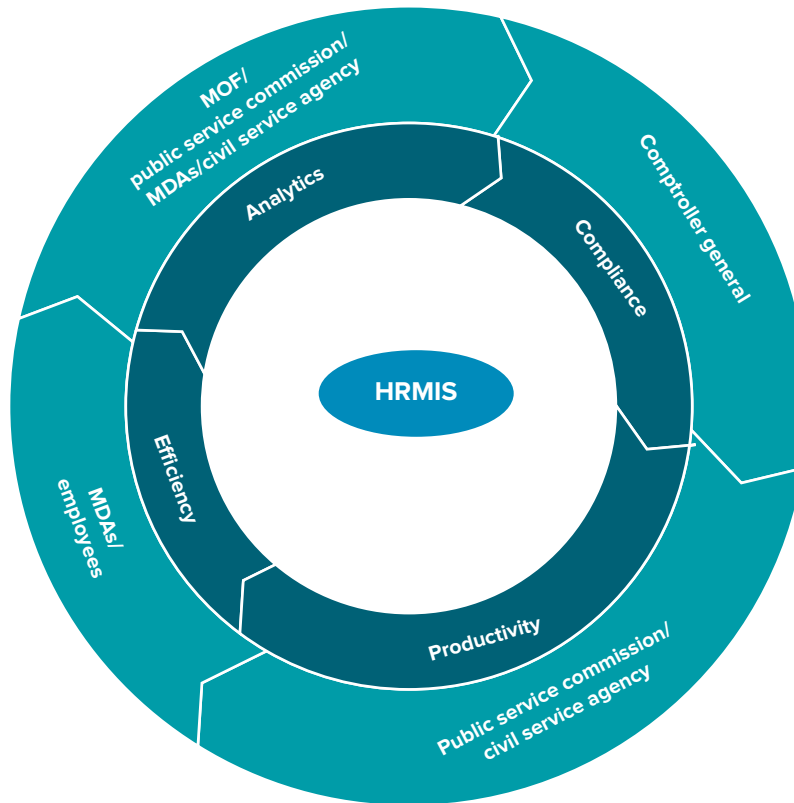
These lessons are generalizable to other data infrastructures. A modular approach to reform can be applied in non-HRMIS settings as well. For instance, reforms for public procurement information systems may focus on the bidding process or on contract implementation. Additionally, analytical insights can be derived from each one of these modules, but only once data quality and completeness are ensured.³ A sequential and flexible approach to reform is beneficial in non-HRMIS settings as well. Shocks, whether political or technical in nature, can occur regardless of the content of the information system, and reform teams should be ready to address them in both the preparation and implementation phases.

This chapter is structured as follows. Section 2 presents policy objectives and associated issues for an HRMIS. Section 3 presents a typology of HRMIS core modules and how these modules relate to one another. Section 4 presents a framework for HRMIS reform implementation. Section 5 provides an overview of the case studies and applies the conceptual framework to the cases. Finally, section 6 concludes.

HRMIS POLICY OBJECTIVES

In this section, we present four objectives common to HRMIS: compliance for fiscal sustainability, employee productivity, process efficiency, and analytics for decision-making. In so doing, we also highlight issues in their implementation. Each HRMIS module maps onto key policy objectives for an HRMIS: the compliance

FIGURE 9.1 Policy Objectives for Human Resources Management Information Systems and Respective Stakeholders



Source: Original figure for this publication.

Note: HRMIS = human resources management information systems; MDAs = ministries, departments, and agencies; MOF = ministry of finance.

objective is associated with core modules, such as payroll, employee productivity is associated with talent management modules, and analytics for decision-making is associated with analytical modules. Process efficiency is cross-cutting and often directly relates to the way HR records are produced. For example, the appointment of civil servants may require long verification processes, often done manually. Automation of the process could increase HRMIS efficiency. Figure 9.1 highlights these policy objectives and their stakeholders.

Compliance for Fiscal Sustainability

Wage bill compliance with the established budget is necessary for fiscal sustainability. The comptroller general, or another agency responsible for government payroll, manages payroll controls for budgetary compliance. At a more granular level, payroll controls include verifying the authenticity of employment and ensuring accurate payroll calculations and reconciliations. Verifying the authenticity of employment requires identifying and eliminating ghost workers.⁴ Ghost workers adversely impact fiscal sustainability and often draw negative attention from the public and policy makers. Another important control is compliance with budgetary ceilings. In many jurisdictions, the approved budget is not directly linked to payroll, leading to overspending. HRMIS regulations should be interpreted correctly and consistently to calculate pay, allowances, and deductions. Employee records should be updated regularly, with bank reconciliations and payroll audits to ensure integrity and compliance.

Employee Productivity

The public service commission and the civil service agency are entities focused on employee productivity and engagement. An HRMIS should give them an accurate overview of employees to help them improve recruitment, develop the performance of the workforce, and enhance their skills. Information on employee qualifications and skills can inform a strategic view of workforce training so that these entities can design training strategies around skills shortages and respond to emerging capacity needs. Recruitment patterns can be analyzed to improve talent pools and reduce potentially discriminatory practices. The performance of the workforce can be monitored using metrics on engagement and attrition rates. In the absence of these measurements, stakeholders are unable to approach employee productivity in an evidence-based and strategic manner.

Process Efficiency

Government agencies, including the ministry of finance, the public service commission, and the civil service agency, are also interested in improving operational efficiency. In some settings, the HR department manually calculates the salaries of employees each month using spreadsheets. This process is not only extremely inefficient but also prone to error. Another example of operational efficiency lies in the hiring process. Hiring departments perform multiple verifications for the first-time appointment of civil servants. These may involve verifying hard copies of key information, such as prosecution history or educational qualifications, from multiple departments and ministries. Manual procedures and hard-copy files delay administrative actions, leading to lower morale, productivity, and efficiency. Process efficiency is therefore another key policy objective for an HRMIS.

Analytics for Decision-Making

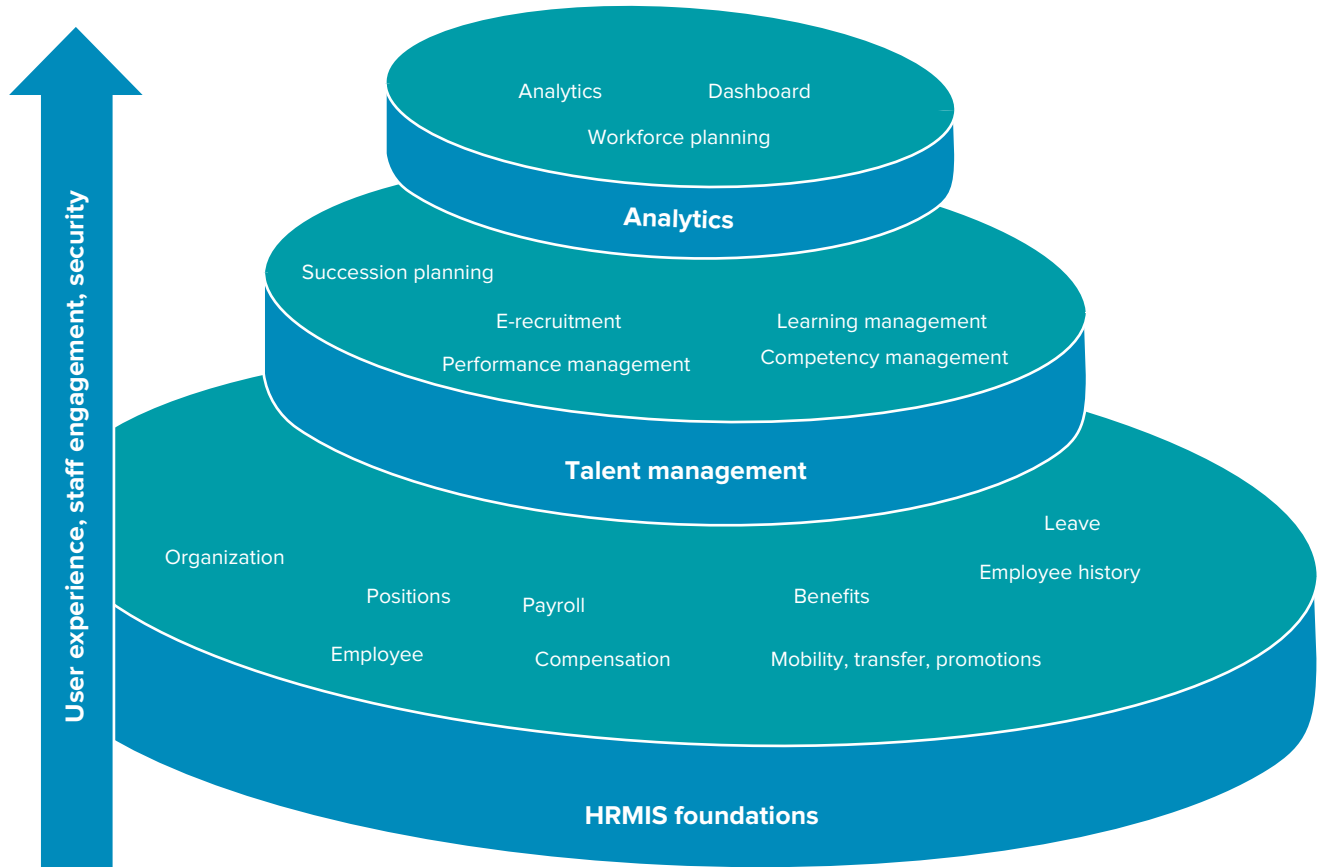
The ministry of finance—together with the civil service agency and the establishment or human resources (HR) department—needs data on HR for making evidence-based, strategic decisions. These decisions concern a range of issues, such as the overall size of the wage bill, salary and pension increases, cuts on allowances, and the financial impact of employee benefits, like medical insurance. Decision-makers need reliable HR reports in a timely manner. In most jurisdictions, these reports are collected manually, through ad hoc measures that take weeks or months, adversely impacting efficient decision-making. In advanced settings, analytics, dashboards, and business intelligence applications are used to enhance effective decision-making.

While these policy objectives are specific to an HRMIS, note that a more general exercise can be done for other information systems. For example, chapter 11 highlights how policy objectives such as budgetary compliance can inform the analytical use of public expenditure data. Ultimately, information systems are designed to assist policy makers in accomplishing their goals. It is only sensible that, depending on the policy area, these goals may differ, but this policy orientation remains the same.

HRMIS CORE MODULES

An HRMIS is an information system designed to enable the management of human resources in the public sector. As such, these technological solutions offer a variety of functionalities, which correspond to modules such as payroll or talent management (figure 9.2). HRMIS reforms require careful consideration of the scope of an intervention—in particular, consideration of which module within the HRMIS will be targeted.

FIGURE 9.2 Human Resources Management Information Systems Data Infrastructure Modules



Source: Original figure for this publication.
 Note: HRMIS = human resources management information systems.

Identifying what modules comprise an extant HRMIS enables the consideration of interdependencies across modules, as well as the feasibility of reform.

HRMIS modules comprise four broad categories, ordered from foundational to analytical:

1. **Foundational modules** ensure compliance and control of both the wage bill and personnel. They include payroll (benefits and compensation) management, position and organizational management, career management, and employee profiles, among others.
2. **Talent management modules** include recruitment and performance management, competency, and learning, as well as succession planning. Talent management is used primarily to improve employee productivity.
3. **User experience and employee engagement modules** improve user experience and employee engagement. These modules encompass employee and manager self-service and staff survey systems.
4. **HR analytics** can be developed for workforce planning, as well as strategic and operational decision-making, once the data infrastructure layer has been developed.

These modules provide the basic infrastructure layer for HR data and associated analytical outputs. The foundational modules are responsible for the accurate and reliable storage of any form of HR record. Talent management modules monitor career life cycles, and user experience modules monitor the overall experience

of users who interface with the MIS or whose data comprise its case data. Finally, the analytics layer extracts value from the underlying data infrastructure to inform strategic decisions at an operational level.

An analogous structure can be found in other MIS. For instance, when considering customs data (see chapter 14), foundational modules include revenue collection and the release time of goods. These modules comprise their own records (“What was the monetary value of the customs declaration for a particular good?”) and potentially their own indicators (“What was the total revenue on exported goods for the month of June?”). Analytical modules provide these indicators to inform policy making. As an example, if customs authorities detected an atypical decrease in tax revenues for a given month, they might send a team of auditors to verify why this occurred. This example highlights how, while the data content of these systems differs, the logic by which they are organized remains largely the same.

Note that each of the modules outlined in figure 9.2 is connected to a set of records and measurements, described in further detail in table 9.1. The table highlights the variety of available HRMIS indicators and

TABLE 9.1 Human Resources Modules and Associated Measures

Module	HR measures
<i>Foundational</i>	
Payroll	Size of wage bill and budget/position compliance; deviation of wage bill expenditures from the budget; sector, administration, and geographical breakdown; percentage of employees in various categories—civil servants, public servants, part-time, wage bill arrears
Position management	Establishment control—employees paid against the approved positions in the budget; average tenure on a position; regional quotas; ratio of public servants, civil servants, political appointees, temporary workforce, and other employee categories
Organization management	Organization architecture reflecting government structure
Employee master data	Tracking of policy effectiveness on gender ratios, regional quotas, and minorities, disabled, and other minority groups; education profiles—degrees and certifications; experience; history of service; ghost workers as a percentage of total workers
Personnel development	Competency improvement measures; promotions; secondments
Benefits management	Benefits and their cost impact
Compensation management	Salaries and allowance structures; compensation equity/disparities in allowances/pay across sectors, administrations, and geographies
Time management	Absentee rate; overtime; staff on various types of leave
Pension	Pension as a percentage of the wage bill; future liabilities; impact of pension increases on budget
<i>Talent management</i>	
Performance management	Top-rated and lower-rated employees disaggregated by ministry, department, and agency; rate of performance reviews completed—ministrywide
E-recruitment	Time to hire; time to fill; applications per job posting; recruitment patterns; applicant profiles; recruitment method—through public service commission, direct contracting, contingent workforce, political appointments, or internal competition; ministry-level appointments
Learning management	Training and skills metrics
Succession planning	Percentage of identified positions that have an identified successor
Workforce planning	Ratios—gradewise and sectorwise; promotions; vacancies
Career development	Promotion rate; average time to promote in a grade per service category
Competency management	Percentage gaps in required competencies

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TABLE 9.1 Human Resources Modules and Associated Measures (continued)

Module	HR measures
<i>User experience and employee engagement</i>	
Employee self-service	Time taken to complete an HR transaction; number of self-service systems available
Manager self-service	Time taken to decide or approve HR transactions; number of manager self-service systems available
Mobile apps	Number of mobile apps available for various HR functions—leave, profile
Employee engagement surveys	Number of employees responding to surveys; satisfaction rate with management and HR policies
<i>HR analytics and reporting</i>	
HR reports, analytics, or dashboards/workforce planning	Levels and distribution of employment; wage bill and its distribution across sectors, administration, and geographies; wage bill and its impact on fiscal sustainability; wage bill as a percentage of revenue; wage bill as a share of GDP; public vs. private employment; sector, administration, and geographic distribution of public employment

Source: Original table for this publication.

Note: HR = human resources.

their corresponding modules, which can be selected and adjusted to practitioners’ needs. A payroll module may include different sets of measurements, from the size of the wage bill to a breakdown of contract types for civil servants. This diversity implies that practitioners may select measurements that are relevant to their use case, prioritizing some modules and indicators over others.

OPERATIONAL FRAMEWORK FOR HRMIS REFORMS

HRMIS reforms are designed to address issues and bottlenecks that prevent stakeholders from accomplishing their policy objectives, such as improving compliance and employee productivity. The implementation of HRMIS reforms can be divided into three stages: preparation, implementation, and monitoring. Figure 9.3 outlines the different phases and their respective components, and the following subsections discuss each of the steps outlined.

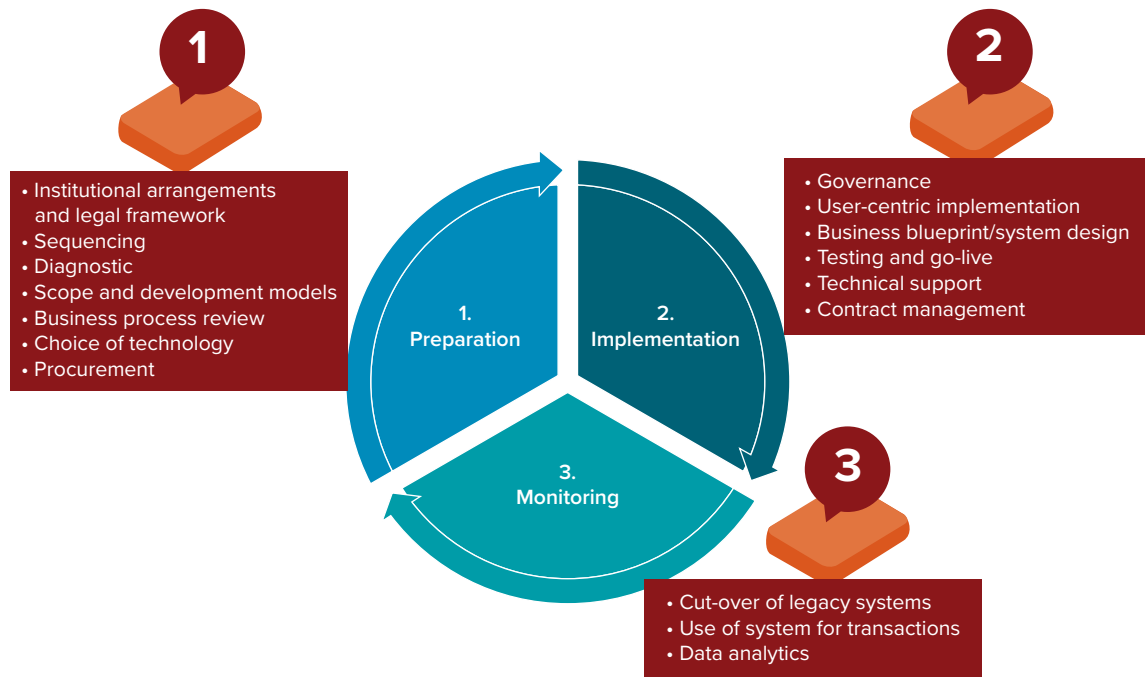
Note that the stages of HRMIS reforms described in the subsequent sections are agnostic with respect to the particular module targeted for reform. Different HRMIS reforms, whether in building an analytics dashboard or improving foundational modules, require a similar approach with regard to the sequence of implementation. Of the multiple elements contained in each of these phases, practitioners are encouraged to begin by assessing which elements are of the greatest importance to the implementation of a particular HRMIS reform project in their setting.

Preparation

The preparation phase lays the groundwork for the implementation of HRMIS reforms. In this phase, key design choices occur, such as defining the scope and the technology to be deployed. Additionally, the preparation phase is an opportunity to engage in a comprehensive diagnostic of the current HRMIS, as well as define the scope of the reform and identify the modules that will be addressed in the intervention.

The preparation phase is an opportunity for the reform team to familiarize themselves with their institutional context as well as the extant data infrastructure, adjusting their strategy in the process. In settings

FIGURE 9.3 Human Resources Management Information Systems Reform Sequence



Source: Original figure for this publication.

where a decentralized HRMIS is in place, the implementation team may require senior management support to promote reforms to different agencies. Much of the effort in the preparation phase should be spent on ironing out institutional coordination issues.

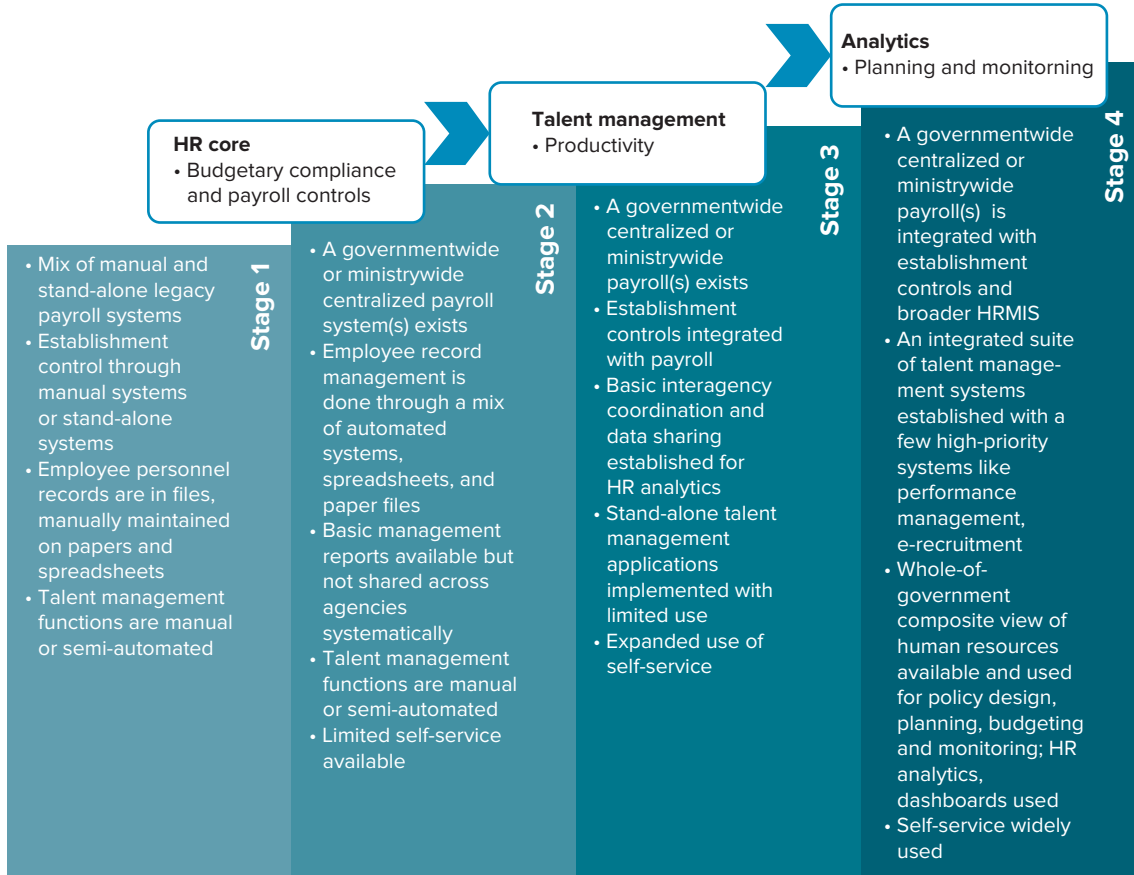
Rollout Strategy and Sequencing

A system rollout strategy should be prepared to guide the implementation. The strategy should address key issues of the scope and sequencing of the rollout. The rollout strategy builds on the mapping of the different modules of the HRMIS. In contrast to the broader HRMIS implementation sequence, the rollout strategy defines how the intervention will achieve the development of the HRMIS. This sequencing accounts for the level of maturity of the current HRMIS, as outlined in figure 9.4.

In terms of sequencing, most countries spend considerable effort on first establishing the basic data infrastructure layer and ensuring compliance and controls (stage 1). Compliance generally centers on the financial compliance of payroll with budget but also on the accurate calculation of payroll to avoid paying ghost workers. Once the data infrastructure layer has been established, it would be prudent to work on data analytics, HR reports, and workforce planning through the implementation of these modules. However, it is worthwhile to note that raw analytical reports can be shared with decision-makers even during the foundational modules, without waiting for the full-blown implementation of analytics modules.

We can generalize stages of maturity in data infrastructure to other cases beyond HRMIS. Budgetary compliance and control in an HRMIS refer to more general principles of data quality and comprehensiveness, which allow for a transition from stage 1 to 2. This is a foundational step for data infrastructure in the public sector: it allows for the reliable collection and retention of data on a variety of HR procedures. The next step is the transition from stage 2 to 3, focusing on productivity: the use of HRMIS data to generate performance or productivity metrics on personnel. This requires access to reliable data, produced by

FIGURE 9.4 Human Resources Management Information Systems Maturity



Source: Original figure for this publication.

Note: HR = human resources; HRMIS = human resources management information system.

the careful implementation of step 1, as well as defining how to measure productivity and which indicators would be necessary to do so. The final step is planning and monitoring, where reliable data produce indicators that inform policy making. This characterizes an HRMIS that has transitioned to stage 4 of data analytics.

Institutional Coordination and Legal Framework

The implementation of a new HRMIS requires institutional coordination due to its complexity and its multiple stakeholders. One of the first steps in institutional coordination is identifying the principal stakeholders in an HRMIS. In most settings, the comptroller general of accounts, under the ministry of finance, is responsible for the payroll and leads the initial implementation to improve budget compliance, payroll calculations, and overall efficiencies. However, in other settings, it is the civil service agency that is responsible for an HRMIS and leads the initial implementation.

An HRMIS may also be decentralized. In this context, the ministry of finance is more focused on ensuring payroll compliance with existing regulations. It requires line ministries and respective HR departments to send payroll payment requests to the comptroller general to ensure budgetary control through an integrated financial management system. This decentralized arrangement could pose additional challenges to reform due to the multiplicity of stakeholders, siloed data, and the need for coordination. In such a case, reform may require additional coordination and buy-in from the implementation team.

Legal authorizations and associated reform strategies should be secured prior to reforms. For instance, the implementation team may require a set of legal documents authorizing the implementation of the reform, which may include terms of reference and procurement requirements to hire a vendor. These documents clearly articulate the scope of the reform to the implementation team and affected agencies. They provide assurance that necessary permissions have been secured for the project, reducing uncertainty and potential negative repercussions for not complying with the existing regulatory framework.

To avoid political resistance to reform, a softer approach can be adopted. Under this approach, line agencies can continue with their previous HRMIS but are asked to provide HR data to a central repository directly from the legacy system. However, this approach does not address inefficiencies associated with duplicative investments and siloed approaches, nor does it ensure compliance once the reform is implemented. Considerable delays and noncompliance can occur, though analytics information for decision-making may become initially available.

Defining the Scope of an HRMIS

Changes to an HRMIS can target one or more of the HRMIS modules outlined in section 2. Note that the choice of scope entails important trade-offs between the breadth of the intervention and the feasibility of the reform project. Three possible scopes for HRMIS reforms are:

- **Increasing the number of indicators and modifying existing indicators for a particular HRMIS module.** For instance, reform stakeholders may be interested in obtaining additional information on the types of appointments of civil servants. This may include further disaggregation of appointment indicators: whether civil servants are tenured, political appointees, or on temporary contracts.
- **Expanding HRMIS coverage by increasing the number of modules.** A key decision may be what institutions will be covered under the HRMIS and how that coverage will be phased in. Certain institutions may differ in important ways from those in the wider service. How will these differences affect the types of indicators available?
- **Ensuring national coverage of the HRMIS, including subnational governments.** Civil servants may be spread across the country in various regions, provinces, or districts. Is the HRMIS meant to reach the entire country or some subset of the country? An analysis of employee coverage in these geographical areas would help define the scope and logistical effort in the implementation of the HRMIS.

By choosing the scope of the HRMIS along each of the above dimensions, the implementation team identifies the key issues about which choices must be made. Key areas to be covered could include legal, policy, and institutional frameworks; HR and payroll regulations (including pay scales and allowances and the extent of their consistent application across ministries, departments, and agencies [MDAs]); budgetary allocation; and key issues of compliance, productivity, efficiency, and analytics.

Choice of Technology

Another key decision point during the preparation phase is the choice of technology (figure 9.3). Two major categories of software technology are available: custom-developed software and commercial off-the-shelf (COTS) software, though some open-source software choices are also available.

Under the custom-developed software approach, the likelihood that users accept the new software and procedures is higher because these implementations can be adapted to user requirements. For example, case study 9.2 outlines how the implementation team in Brazil tailored a solution to detect payroll irregularities using custom-developed software. The solution extracted HRMIS data and presented them in exactly the way payroll analysts required to execute their tasks. This level of customization, however, comes at a cost. Custom-developed systems require higher in-house capacity because all parts of the software have to be coded from the bottom up, rather than relying on a prepackaged solution.

Additionally, maintenance for custom-developed software tends to be higher in the long run because any changes to the underlying data infrastructure require changes to the software itself. If the original implementation team is no longer present—as is often the case—a new implementation team has to start from ground zero.

COTS software often contains prepackaged good practices and tighter integration between different parts of the information system. It also frequently comes with regular software updates, reducing the risk that the technology becomes obsolete. Major COTS packages include SAP, Oracle, and PeopleSoft, though financial management software like FreeBalance also provides public-sector-relevant HRMIS modules. As a result, COTS software applications are more robust and easier to maintain than their customized counterparts. However, this robustness comes at a cost. Adaptation to user needs—such as introducing novel indicators or modules—is, in general, difficult if not impossible to implement within the existing COTS software. Because the software is proprietary, modifications to the underlying software are not available to the implementation team.

Overall, custom-developed software is more suitable for nonfoundational modules, while a COTS solution is better suited to foundational modules because it ensures tighter linkages of these modules with each other. For modules like e-recruitment or performance management, governments can choose any technology platform from the market that meets their requirements and is cost efficient. Integration of these modules with the foundational HRMIS modules will ensure data integrity.

Procurement

In most cases, HRMIS reforms are not fully delivered “in-house” by governments, for a variety of reasons. For instance, COTS solutions require that an external vendor build and deploy an HRMIS for use by a government agency. This includes the introduction of new modules and the training of government officials on how to properly use and manage the software. For customized solutions, the government may lack access to a team of software developers and data engineers to fully develop the solutions. As a result, it may have to rely on external vendors with the required expertise to do so.

As a result, an external vendor must be procured to support reform implementation. The culmination of the preparation phase is preparing a procurement package for the HRMIS implementation partners. The procurement document should cover multiple aspects of implementation: business process review, the deployment and rollout plan, quality assurance and testing of the solution, and the help desk and support strategy, among others. Client and vendor responsibilities, risks, and rights—such as intellectual property—should be protected equitably, in line with industry good practices.

Implementation

The second stage of the implementation of HRMIS reforms, as outlined in figure 9.3, is the actual implementation of the reform plan. The implementation stage includes the management of HRMIS reforms, which first requires considering and defining the governance structure. Additionally, during the implementation phase, it is the responsibility of the implementation team to provide and adapt the business blueprint that guides the project. Iterative testing must take place to ensure that the project scope is being successfully developed. Technical support and a help desk ensure that users are supported throughout the implementation phase. Contract management ensures that expectations are aligned between government clients and external vendors.

The implementation stage of HRMIS reforms thus requires clear authority by the implementation team to make decisions and communicate them clearly to potential external vendors and end users. Flexibility is also required during the implementation stage, as well as proper documentation of any changes in the project design as a result of the implementation stage. Due to this flexibility, it is important to coordinate with external vendors during the rollout of implementation and to collaboratively decide whether changes are

indeed feasible under the existing contract or if additional resources—financial or time—may be necessary to successfully roll out the reform. We provide further detail below.

Governance Structure

For effective implementation of HRMIS reforms, it is often necessary to form a steering committee to provide strategic guidance and ensure support from the project sponsor. This steering committee should ensure that key stakeholders are fully represented and consulted. The committee should have the authority to make strategic decisions and resolve strategic-level conflicts. To improve the efficiency of decision-making and the quality of implementation, the steering committee in some settings can also issue basic principles of implementation. These principles can be customized by context and include standardized business processes, user-centric system design, security, and privacy, among others.

The project director should be supported by a project management team, where possible, including procurement and financial management specialists, a project manager, a communications team, and change management teams, among others. A core team of subject matter experts from the ministries should be consulted to ensure they codesign and codevelop the system with the implementation partners. The core team should have a say in decisions carried out by the steering committee, ensuring co-ownership of the solution.

System Design Document

The implementation team should prepare and revise a system design document throughout the implementation of the project. The system design document defines the needs and requirements for the new design of the HRMIS and should be approved by the steering committee before implementation. After launch, any modifications to it should be subject to steering committee approval as well. This living document becomes the final scope document with the technical details of the implemented solution. It also becomes the reference technical design document for future upgrades, and for any new implementation team if the existing vendor changes.

Iterative Testing

Changes to the HRMIS should be developed iteratively. Iterative testing allows for controlled and reversible innovation within the HRMIS reform project, relying on feedback from senior management and staff who will ultimately use the new HRMIS. For instance, an implementation team may be interested in developing an interactive dashboard to measure employee engagement. However, an initial focus on indicators such as employee satisfaction may have to be replaced by employee exit surveys after an initial round of feedback from the steering committee, which is concerned about employee turnover. Iteration preserves flexibility and identifies features that, in the implementation stage, may not be considered relevant. Additionally, it enables adjustment to happen in reversible and controlled stages that do not jeopardize the wider integrity of the project. All changes made during iterative testing should be documented in the system design document.

Technical Support and Help Desk

Technical support allows users to successfully navigate the transition to the reformed HRMIS. Clear documentation on how to use the remodeled HRMIS, as well as a help desk, should be implemented during the project rollout. This ensures users have sufficient information to use the HRMIS during and after the reform process. Failure to do this may result in increased user resistance because users may be confused and unable to operate the new system. Standardized help desk software tools, together with a telephone helpline, should be provided to ensure that user requests are appropriately logged, assigned, resolved, and monitored. Frequently asked questions should be compiled and shared, empowering users to find solutions to their own problems, minimizing help desk calls, and building a knowledge base of solutions.

Contract Management

Contract management is another critical aspect of implementation. Implementation failures are often the result of inadequate contract management. Issues like the scope of the contract and any modifications require that both the steering committee and the vendor align expectations before and during the implementation of HRMIS reforms. Expectations should also be aligned regarding the payment schedule and the responsibilities of the contractor and vendor during the implementation process to avoid confusion and ensure smooth implementation of the project. A collaborative approach in contract management, which considers vendors as partners and not as contractors, is recommended. This collaborative approach creates a mindset of shared responsibility for successful HRMIS reforms.

Monitoring

The third phase shown in figure 9.3 is monitoring the HRMIS once it has been implemented and is in place. The monitoring phase focuses on issues the implementation was meant to address and quantifies the benefits in terms of business results. Often, the implementation team monitors the project in terms of module development, user acceptance, trainings, and so on. While this approach could be useful for internal project management, it has limited utility at the strategic level if the modules have been developed but the business results are not delivered. Therefore, utilization of the system and its coverage should be the key focus of monitoring. If user departments continue to use legacy arrangements while the newly developed HRMIS is only used as a secondary system, the business benefits will be limited.

Transition from Legacy Systems

Even after HRMIS implementation, it is often difficult to fully transition from the legacy system to the redesigned HRMIS. The use of the legacy system as the primary system of records and transaction processing poses a serious challenge. Continued use increases the workload by requiring the constant synchronization of old and new data systems. If the legacy system is still used as the primary system of records after the reform, this reduces the likelihood that the newly developed HRMIS will be used as the primary system. Therefore, during and after the implementation of HRMIS reforms, the legacy system should be gradually shut down to ensure there is a complete switchover to the new system. If required, governmentwide regulations and directives should be issued to ensure the use of the new HRMIS.

Key Performance Indicators

Key performance indicators can help implementation teams gauge the relative success of the implementation process. These indicators should allow the implementation team to monitor how well the reform has performed. For instance, if the implementation team is intervening in a payroll module, it may develop an indicator on the proportion of the wage bill processed through the new HRMIS. Additionally, if one of the goals of the reform is to ensure payroll compliance, indicators can be developed to detect ghost workers. The proportion of employees with verified biometrics is an example of a key performance indicator that enables measurement of this goal.

Monitoring Analytics

The use of monitoring analytics can provide stakeholders with immediate feedback on implementation. An HRMIS should be used to provide analytical information to key ministries involved in strategic decision-making. Initial monitoring should be provided even of foundational modules while the data analytics pipelines and dashboard applications are not fully developed. This will maximize the business value of the data gathered in the HRMIS. It will also provide a political support base for the system when the key

decision-making ministries harness the benefits of these investments. These ministries could include the ministry of finance, the public service commission, the civil service agency, and other large MDAs.

CASE STUDIES: HRMIS REFORMS IN PRACTICE

To illustrate the implementation of HRMIS reforms in practice, we provide a set of HRMIS case studies that showcase how government officials and practitioners have employed the techniques outlined above in the reform process. In so doing, we highlight patterns in the development of data infrastructures, common challenges, and the design choices that guided these teams in their development efforts. These cases describe the HRMIS reform process as it was experienced by practitioners. We recognize that these cases represent two developed countries and one developing country with access to a mature HRMIS. As a result, practitioners should tailor lessons in this section to their own context. We highlight how the operational framework for HRMIS reforms is generalizable to other settings as well, from building foundational modules to implementing analytical modules. Subsequent case studies provide a fuller description of the cases, while this section provides a comparative analysis of all three.

Luxembourg

In Luxembourg, the State Centre for Human Resources and Organisation Management (CGPO) is a central government administration, located in the Ministry of the Civil Service. Its mandate spans multiple responsibilities, from managing the life cycle of civil service personnel to strategic workforce planning. In 2016, the CGPO faced growing demands and follow-up needs from HR specialists and decision-makers in the federal government of Luxembourg. As the volume of these requests increased, it became clear to the CGPO that its HRMIS had to change.

In 2017, the CGPO developed and deployed a comprehensive HRMIS reform, which enabled the CGPO to build a comprehensive HR data infrastructure and framework to plan and monitor HR in the government of Luxembourg. The solution developed was large in scale, involving multiple data sources and HR specialists. This analytics center, the HR BICC, was developed over the course of a year and had important transformational consequences for the way HR was conducted. An illustration of the novel dashboard is presented in figure 9.5. It integrates both HRMIS data and strategic planning documents in a comprehensive dashboard portal (in orange).

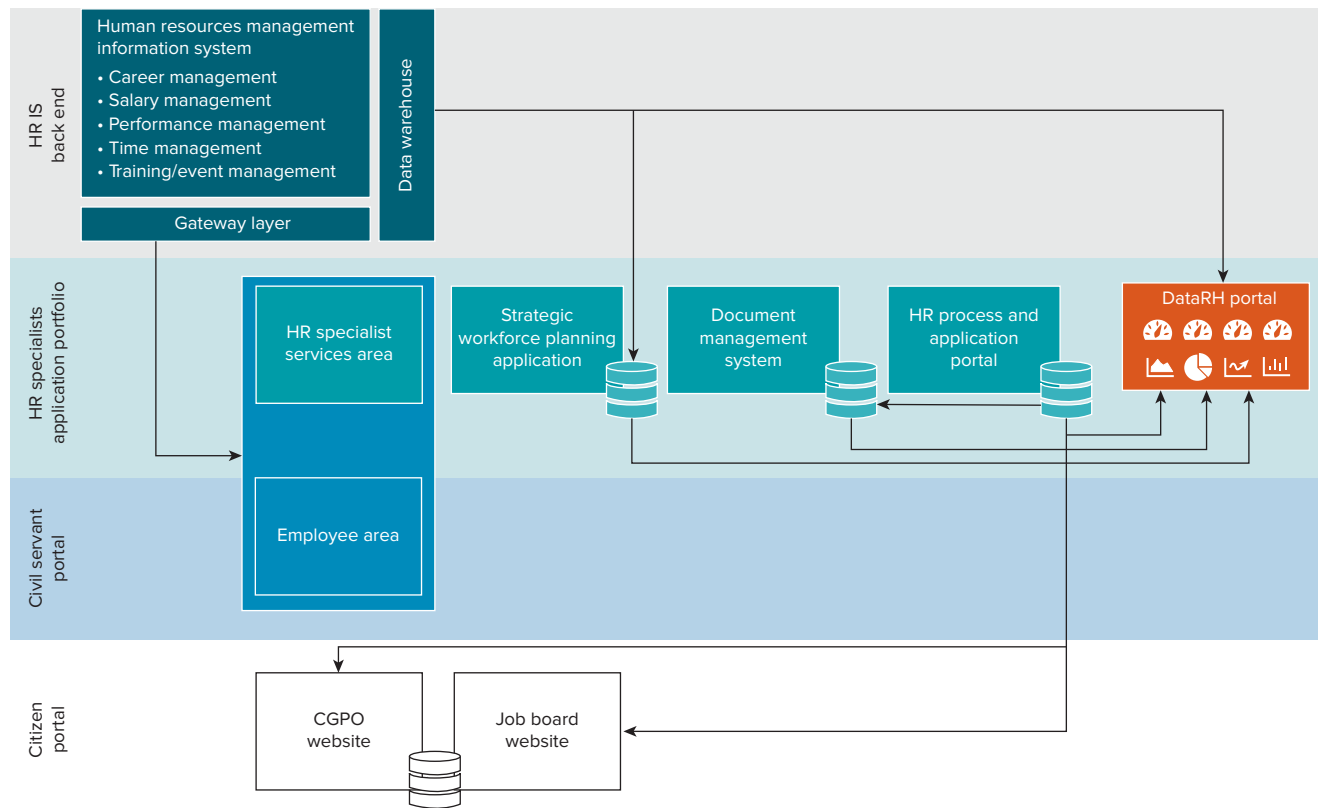
The Luxembourg case presents a fully integrated HRMIS pulling together all the major databases that are typically the focus of such exercises. As such, this case is the most comprehensive example of the implementation of a full HRMIS analytics module, as outlined in figure 9.2.

Brazil

In Brazil's federal government, payroll quality control is the responsibility of the Department of Compensation and Benefits (DEREB). DEREb flags paycheck inconsistencies before disbursement, which are then forwarded to federal agencies' HR departments for correction. The task is challenging. The case volume is large, with tens of thousands of individual paychecks processed daily. Additionally, a complex set of regulations governs how payments should be disbursed. To enforce these rules and detect inconsistencies, a team of payroll analysts individually verifies each paycheck. The implementation team sought to improve this process.

In 2019, a partnership between DEREb and a private data science consulting firm (EloGroup) resulted in the development of a machine-learning-empowered fraud detection system. To generate the necessary data

FIGURE 9.5 Human Resources Management Information System, Luxembourg



Source: Adapted from CGPO.

Note: CGPO = State Centre for Human Resources and Organisation Management; HR = human resources; IS = information system.

to train this algorithm, a thorough restructuring and integration of the extant data infrastructure on payroll, compensation rules, and HR were developed. Through the development of new extraction, transformation, and loading (ETL) processes, this solution enabled auditors to better detect irregular payroll entries, increasing savings and improving efficiency.

The Brazil case illustrates that, although some HRMIS reforms may be relatively narrow and aimed at a particular outcome—in this context, fraud detection—many of the themes outlined in earlier sections are still of relevance to their implementation. Many of the steps taken in the development of the fraud detection system are foundation stones for wider HRMIS reforms, highlighting how the same methodology can be applied even in smaller contexts.

United States

Every year, the Office of Personnel Management (OPM) Federal Employee Viewpoint Survey (FEVS) is administered to over 1 million federal civil servants in the United States.⁵ The FEVS measures employees' engagement through a variety of survey questions and provides valuable information to government agencies. In theory, it presents data on agency strengths and opportunities for improvement in employee engagement. However, extracting insights from the FEVS is challenging. Once given access to the survey, government agencies spend weeks analyzing the data to operationalize their findings. This effort is labor intensive and costly. An HRMIS reform team sought to accelerate this process.

In 2015, the NIDDK, within the National Institutes of Health (NIH), developed the Employee Viewpoint Survey Analysis and Results Tool (EVS ART) to extract rapid and actionable insights from

the FEVS. While not generating a new data infrastructure, EVS ART relied on the creative use of Microsoft Excel to extract and transform data to produce dashboards automatically from a single data file. Effectively, the Excel worksheet developed by the NIDDK team integrated a data infrastructure and a dashboard into a single platform.⁶

The US case illustrates how a grassroots initiative, undertaken within the public service rather than as a centralized effort, faced some of the key issues outlined above in its HRMIS reform process. While limited in scope, the implementation team found creative solutions to derive strategic value from the FEVS. It adapted the solution to its needs and was able to effectively improve how survey evidence could be operationalized into improvements to employee engagement.

What Modules Were Targeted for HRMIS Reform?

All the cases we have presented directly relate to HRMIS and can be mapped directly onto the HRMIS core modules in table 9.1. In the case of Luxembourg, a new HR analytics module was developed, with dashboards and reports, to enable HR management by the CGPO. In Brazil, a machine-learning algorithm was deployed to ensure that payments followed established regulations, in a clear example of the compensation management module. Finally, EVS ART is an example of an employee engagement module: a federal engagement survey to guide strategic planning in the NHS.

Note that in the cases of Luxembourg and Brazil, although the end product targeted a single module, the solutions required the deployment of multiple modules. For instance, in Brazil, both the compensation module as well as the employee and organizational modules were combined to provide data for the machine-learning algorithm. In the case of Luxembourg, the analytics dashboards were supplied with data from various core modules in the HRMIS, such as compensation, organizational management, and performance management. For the United States, since EVS ART was based on a single employee engagement survey (the FEVS), no additional HRMIS modules were integrated.

Preparation: Laying the Groundwork for the Intervention

This section outlines general principles involved in the two initial stages of the development of data analytics: preparation, where practitioners lay down the groundwork for the intervention, and implementation, where a decision-making process that is collaborative and adaptable plays a crucial role. We highlight what is generalizable and particular about each phase for the specific cases analyzed in this chapter. The accounts are not designed to be exhaustive: rather, they illustrate key concepts and sequential logics that may apply to the practitioner.

Institutional Coordination

A key factor in the preparation phase is obtaining the necessary support from senior leadership. This support is what confers on the reform team the authority to make executive decisions and secure collaboration for the intervention. In general, a centralized authority with a mandate over a policy area makes reform easier. In Luxembourg, the implementation team was commissioned by the CGPO. The CGPO enjoyed a broad mandate that focused specifically on HR, from the management of the life cycle of personnel to strategic workforce planning. This broad mandate meant that once the decision to develop a new dashboard was made, no additional permissions were necessary.

In the United States and Brazil, leadership support was granted by senior management within the respective agencies. In the United States, the implementation team was based in the NIDDK, situated within the NIH. The NIDDK's senior leadership understood the importance of the effort and supported the team's effort—granting time, flexibility, and necessary resources. In Brazil, the senior leadership of the Department of Personnel Management and Performance (SGP), which oversees DERE, gave full support to the project.

Respecting the Legal Framework

The development of innovative technologies, such as data analytics, requires careful consideration of the existing legal framework, particularly in the public sector. It is necessary to assess whether there are rules and regulations in place that may limit the scope of the intervention and to ensure that the proper permissions are obtained. Depending on the mandate of the agency, as well as the regulatory environment, different legal permissions may be necessary. For instance, in Luxembourg, due to the CGPO's broad legal mandate to generate analytical insights on HR, it was not necessary to request additional permissions to implement the analytics pipeline. In the US, likewise, due to the limited scope of the intervention, no extensive legal framework was needed.

In Brazil, however, where regulations and norms govern how projects are implemented, extensive legal consultations were necessary. The agency partnered with the consulting firm, as well as with another agency familiar with technological innovation projects, to draft the project proposal and obtain the necessary permissions and legal documents. These cases highlight how interventions operate within the boundaries of existing legal frameworks and need to abide by laws and regulations to ensure their legality and feasibility.

Choice of Technology

As outlined above, COTS solutions strengthen sustainability in the long run because they offer the technical assistance of a dedicated enterprise and tightly integrated tools. On the other hand, COTS solutions often lack the precision of custom-developed solutions, which are tailored to the specific needs of clients. COTS solutions may also cost more due to the high cost of licenses and upkeep. Custom-developed solutions, while more adaptable and flexible, require costly investment in a team of skilled developers to create as well as a long period of iterative maturation. Additionally, upkeep may be expensive if proper code documentation and dedicated maintenance staff are not set in place.

Our cases illustrate these trade-offs. Luxembourg opted for a COTS solution—in particular, a dashboard tool that had already been deployed by the implementation team in another, non-HRM context. The team opted to repurpose that tool for their needs, capitalizing on accumulated experience from a previous project, with a relatively short maturation period. The United States also opted for a COTS solution, Microsoft Excel, which was heavily customized for the requirements of EVS ART. The tool allowed the team to generate indicators and dashboards through the development of scripts that automatically converted data input from the FEVS into dashboard outputs.

Brazil opted for custom-developed, open-source software, developing its solution using Python and open-source machine-learning packages. The solution was deployed in a computing cluster on the cloud, where both a data pipeline and a fraud detection statistical model were hosted. The solution was tailored to the specific requirements of the auditing team, capturing both business process regulations and anomaly detection algorithms with the available HR and payroll data. Due to the technical nature of the project, its implementation was outsourced to a consulting firm.

Scope and Deployment Models

There are clear trade-offs embedded in the choice of the scope of a project. Narrow scopes allow for quicker implementation and greater ease of use. However, they make it more difficult to scale across agencies due to their highly specialized nature. Broad solutions require intensive training and adaptation by users, as well as additional resources for the building of complex tools.

Luxembourg's CGPO opted for a broad scope, commensurate with its broad HRM mandate. The dashboard ecosystem was expansive and provided a wide array of insights, ultimately producing over 157 applications (HR dashboards) and over 2,600 sheets. This complexity required extensive data-quality assurance processes, as well as the training of HR specialists to learn how to use these different tools. A dedicated helpline provided additional assistance.

In contrast, Brazil and the United States had a narrower scope for their solutions. Brazil’s solution focused specifically on fraud detection in the federal payroll for the subset of manually imputed payments only. This tailored approach was limited in use to a specific agency and was not amenable to scaling. The NIDDK in the United States focused exclusively on generating insights from the FEVS to guide the agency’s decision. The focus was on employee engagement and methods to improve the agency’s responsiveness. Due to the broad coverage of the survey itself, however, other agencies expressed interest in deploying the dashboard, proving that it was, in fact, generalizable.

Implementation: An Adaptive Journey

User-Centric Implementation

In user-centric implementation, the data infrastructure and solution requirements are defined by how users will use information. Data analytics pipelines are designed to answer user queries and provide answers to a well-defined set of problems, which then inform the required data infrastructure to provide these input data.

For Luxembourg, the mandate for the solution was broad, and the user base varied. The final design of the dashboard attended to multiple user bases, from citizens to HR specialists within the government. Mapping out each user to their use case and ensuring that the dashboards could attend to those needs separately but simultaneously was a key design choice by the implementation team. Multiple data pipelines and dashboards were designed, each for particular areas and users, and within each of these dashboards, multiple data visualizations were available. Figure 9.6 outlines the multiple modules contained in the dashboard solution, including information on pensions and recruitment processes.

For Brazil, extensive consultation occurred among frontline providers (auditors) who were going to use the solution. Feedback regarding the necessary data structure and how it would feed into their auditing decisions was crucial. The team opted for a simple risk score associated with each payment, along with flag indicators for the type of rule violated. In the United States, the users were primarily the management making strategic planning decisions for the agency. As such, the indicators were actionable, such as worker

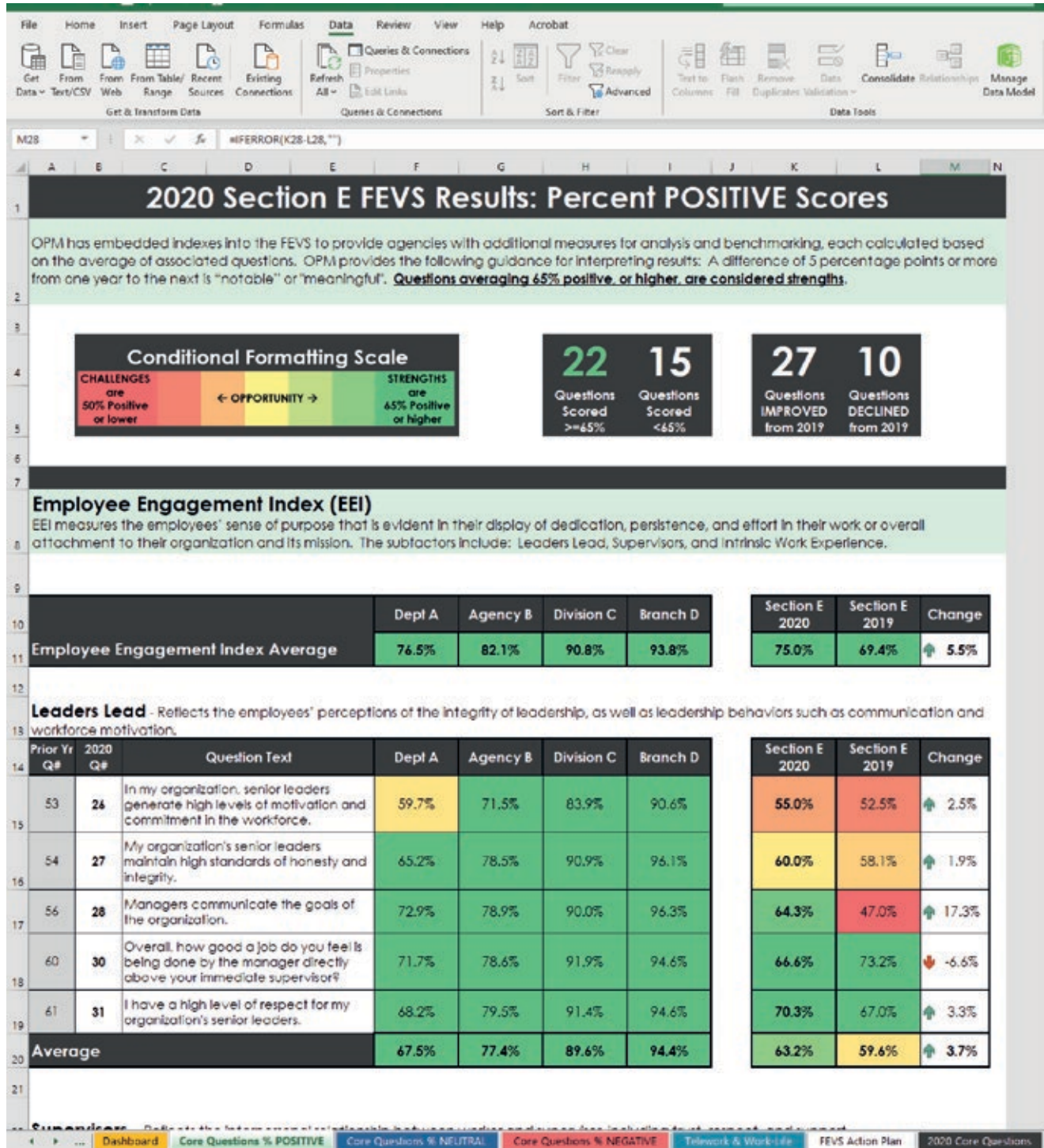
FIGURE 9.6 Luxembourg’s Dashboard Modules



Source: State Centre for Human Resources and Organisation Management (CGPO).

engagement and performance metrics. Organization-level indicators, with positive, neutral, and negative scores, provided ready-access insights into the relative performance of the agency compared to the previous year (figure 9.7). EVS ART also provided an action-planning tab to facilitate strategic planning.

FIGURE 9.7 Percentage of Positive Employee Engagement Scores from the Federal Employee Viewpoint Survey



Source: Screenshot of EVS ART 2020, NIDDK.

Note: EVS ART = Employee Viewpoint Survey Analysis and Results Tool; FEVS = Federal Employee Viewpoint Survey; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases.

Iterative Testing

The development of each data infrastructure and analytics pipeline was gradual and flexible. All implementation teams demonstrated a willingness to test, adapt, and redeploy their analytics solution at each stage of the implementation process. For instance, the Luxembourg CGPO first developed a set of dashboards on legacy career and payroll data. Once the initial dashboards were complete, the team realized that quality issues compromised the integrity of the data analysis. As a result, additional quality controls were set in place to ensure that the dashboards were generated as expected. User feedback and demands gradually expanded the scope of the dashboards, and the implementation team worked on iteratively expanding the scope of the HR BICC.

In the United States, the NIDDK had its own learning curve. The team had to work through a process of backward induction, starting from their conceptualization of the final product while researching and learning how to accomplish each step along the way. From the visual appearance of graphs to the data pipeline required to feed them, each task was iteratively resolved and incorporated into the final product. In Brazil, the implementation team tested alternative machine-learning algorithms to improve fraud detection. Repeated consultation with the auditor team generated new ideas, such as incorporating business-rules flags.

Technical Support

Technical support is crucial to help users navigate the complexity of novel data analytics pipelines—and to be able to build on them. These support systems reduce confusion and facilitate the adoption and diffusion of the technology by new users. In Luxembourg, the CGPO created a helpline to assist HR specialists in the use of the newly developed tools, increasing uptake and facilitating the transition from the legacy system to the new one. The NIDDK team in the United States organized training workshops with different teams and agencies to explain how to use EVS ART as a planning tool. The implementation team created an instruction manual that allows users to navigate the dashboard easily, along with clear and accessible explanations for key indicators and metrics.

In contrast, the Brazil payroll team developed its solution through outsourcing and did not provide a robust system to assist users. The consulting firm, while communicating about the development of the tool, did not create formal channels to address questions and bugs. Rather, support was provided in an ad hoc fashion, depending on user feedback, to address bugs in the code or deployment. While the intense coordination between the consulting firm and the agency reduced user confusion, the lack of a dedicated support team, particularly after the completion of the project, raises concerns regarding the future correction of unexpected changes in the data infrastructure.

LOOKING BEYOND: FEASIBILITY AND SUSTAINABILITY

The cases presented in this chapter illustrate key design choices and their feasibility constraints. Luxembourg's HR BICC has high entry barriers: its implementation relied on an in-house team that had previously deployed a similar business intelligence solution, as well as on hiring a team of in-house data scientists and IT staff to maintain and develop the solution. These investments are costly and rely on institutional changes that may be prohibitively difficult in other contexts. However, these investments facilitate the sustainability of the solution and its continued development.

Brazil's solution was agile and less costly but in many respects brittle. In less than a year, the implementation team was able to produce a machine-learning-based fraud detection system, but technical and political-economic issues raise concerns regarding its sustainability. Reliance on an external development team meant that in-house capacities were not developed. The sustained development and maintenance of the solution are at risk. Additionally, changes in the management of the agency mean that accumulated expertise during the implementation phase can be lost through succession cycles.

In EVS ART, a narrow scope and sustained implementation—over the course of two years—meant that the solution was widely disseminated and consolidated within the NIDDK. Additionally, it was designed proactively for planning and monitoring within the agency, resulting in tight integration with the analytics component. In many respects, the project is replicable with low feasibility constraints, given the ubiquity of Microsoft Excel in the public sector. At the same time, the highly specialized scope of the solution means that it is not easily modularizable and portable to other domains. Excel spreadsheets are, in general, not amenable to scaling. Furthermore, manual data imputation and modification make developing an automated analytics pipeline challenging.

Note, additionally, that monitoring of the solution was an important component in some but not all of these cases. For Luxembourg, the cutover of legacy systems was implemented in tandem with technical support and the training of HR specialists. The deployment of an extensive analytics dashboard gave administrators live feedback and an overview of the new HRMIS. In the United States, EVS ART replaced the manual approach to obtaining insights from the FEVS survey. In Brazil, a new data pipeline was built on top of an existing legacy system but did not seek to replace it.

These concerns are generalizable to non-HRMIS settings. If the implementation team lacks the financial resources and capacity to engage in a large overhaul of the information system, the scope of the project should be limited to a single module or two. At the same time, the team should consider whether a smaller intervention could have potential linkages to other data modules. Additionally, when engaging with external actors, implementation teams should consider how to ensure the sustained development of the solution after implementation concludes. To reiterate, these lessons are not restricted to HRMIS and can be applied in other administrative contexts, such as public procurement and customs data information systems.

CONCLUSION

This chapter has outlined the practical issues and challenges in developing data infrastructure for improved government analytics. It has focused on MIS targeted at HR data, but the lessons presented in the chapter apply to public sector data systems more generally.

The chapter has presented the key stages through which HRMIS implementation or reform typically occurs, structured around an operational framework for HRMIS reforms. It has grounded this conceptual discussion by illustrating these stages using case studies from Brazil, Luxembourg, and the United States. The discussion is based on the World Bank's experience implementing data systems in government agencies across the world, as well as on the experiences outlined in the case studies.

There are trade-offs involved in each of the design choices presented. Without robust quality assurance processes in place, the validity of analytical insights is fragile. But expansive quality assurance may be prohibitively costly and is not feasible for all contexts. Deciding the optimal, feasible level of data quality for an analytical pipeline is a design choice, which highlights how the pipeline of data analytics is highly adaptable. Some countries opted for COTS solutions, while others opted for more customized approaches. Agile development, outsourced to external companies, may provide quick results, but it raises sustainability concerns.

The case studies presented in this chapter demonstrate the complexity and diversity of HRMIS implementation. While defying a one-size-fits-all approach, the cases illustrate how a set of different tools, when applied by a dedicated implementation team, can carve out the space for a more analytically driven HRMIS and data infrastructure more generally. Developing systems that both store and extract analytical insights from public data requires widely applicable methodologies. While the specific applications of data systems may vary, the methodology outlined in this chapter and illustrated here in practice provides a conceptual framework with which to approach this challenge. More detailed expositions of the chosen case studies now follow for those readers who want to better understand the individual HRMIS solutions described in summary here.

Beyond the examples presented in this chapter, we highlight the innovative uses of an HRMIS beyond payroll and HR. The underlying theme for this innovation is the use of disruptive technologies like data lakes and artificial intelligence (AI) to cross-reference HRMIS data with multiple other data sources in order to accomplish a policy objective. For example, HR data can be used to analyze procurement and economic activity data in order to identify corruption. In Brazil, HR data on civil servants were cross-referenced with public procurement contracts through the use of big data and AI. The AI tool identified more than 500 firms owned by public servants working at the same government agency that executed a public contract.⁷ HR data can also be used to cross-reference budget data in order to improve performance by identifying which civil servants lead particular budgetary programs.

In sum, HRMIS—and MIS more generally—can play a crucial role in the innovative use of data to further policy objectives such as reducing corruption and improving the overall performance of the public sector. The conceptual framework presented here extends beyond HRMIS: the identification of data infrastructure modules and an operational framework for reforms can be applied in a variety of policy settings, as highlighted in other chapters of this book. Ultimately, extracting value from data—transforming them into public intent data—means anchoring them to clearly articulated policy objectives. Articulating what these policy objectives are, and what data are required to measure the achievement of these goals, is the first step toward creating data infrastructures for government analytics.

CASE STUDY 9.1 HRMIS CASE STUDY: HUMAN RESOURCES BUSINESS INTELLIGENCE COMPETENCY CENTER (LUXEMBOURG)

Ludwig Balmer, Marc Blau, and Danielle Bossaert

SUMMARY

In 2017, the State Centre for Human Resources and Organisation Management (CGPO) developed and deployed a human resources business intelligence competency center (HR BICC), which enabled it to build a comprehensive HR data infrastructure and framework to plan and monitor HR in the government of Luxembourg. The solution developed was large in scale, involving multiple data sources and HR specialists. This analytics center, developed over the course of a year, had important transformational consequences for the way HR was conducted.

INTRODUCTION

A seemingly narrow question—how much does the government spend on personnel?—requires integrating human resources (HR) data from multiple modules. Which employees (position), types of payment (payroll), and government agencies (organization module) should be included in the wage bill? Policy makers require immediate answers to these questions to make informed personnel decisions. However, a human

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resources management information system (HRMIS) often reacts to ad hoc queries rather than proactively offering a system of answers. This project sought to change that.

In Luxembourg, the State Centre for Human Resources and Organisation Management (CGPO) developed a human resources business intelligence competency center (HR BICC) to provide an integrated overview of HRMIS data in accessible dashboards. This case study shows how this complex technology was developed. The comprehensive scope of the project meant that it integrated a variety of modules, from payroll to talent management. This contrasts with the more tailored approaches of Brazil (case study 9.2) and the United States (case study 9.3). It also provides the clearest example of what chapter 9 describes as an analytics module, the use of HRMIS for strategic and operational decision-making.

A few key lessons emerge from this project. First, quality assurance is paramount to the integrity of the analytics module. The team iteratively cleaned the data and established control protocols to protect its integrity. Second, it is important to reduce the burden of visualization on users. Ensuring visual coherence across dashboards and providing different choices of visualization reduces confusion and increases accessibility. Finally, it is important to provide users with additional support outside the dashboard itself. A helpline can guide users in the proper use of the dashboard as well as generate feedback on whether it is functioning as intended.

This case study is structured as follows. Section 1 provides institutional context on the HRMIS and its management. Section 2 describes the initial challenge and gives an overview of the solution itself. Section 3 explains the project's rollout strategy and reform sequence. Section 4 outlines the lessons learned in the project. Section 5 outlines the impact of the solution. Finally, we conclude.

INSTITUTIONAL CONTEXT

The CGPO is a central government administration in Luxembourg, located in the Ministry of the Civil Service. Its mandate spans multiple responsibilities, including:

- Management of the entire life cycle of personnel, including candidate selection, onboarding, and professional development
- Calculation and management of remuneration and the careers of active state officials
- Management of retired state officials and pension beneficiaries
- Strategic workforce planning management, as well as HR data dashboard publication.

Alongside these responsibilities, the CGPO also provides consulting services. These include business process management and optimization, organizational development, digitalization, and project management. To manage HR data, the CGPO uses an integrated HRMIS, customized to suit its needs. Before the deployment of this solution, the system included information on the careers and salaries of civil servants in Luxembourg. HRMIS data were already centrally managed and stored. Regular and ad hoc extraction routines were executed to provide data insights to CGPO users as well as other public institutions.

INITIAL CHALLENGE AND PROPOSED SOLUTION

In 2016, the CGPO faced growing demand and daily follow-up needs from internal HR specialists and decision-makers in the government. As the volume of demands increased, the CGPO decided to design and deploy an HR BICC. The purpose of the center was to facilitate a comprehensive overview of HRMIS data through the

development of dashboards. This would reduce the burden on the CGPO to respond reactively to demands and would empower consumers of HRMIS data to formulate questions and search for answers within each dashboard.

User orientation was an important principle in the project and was reflected in the development of interactive dashboards (an example is given in figure 9.8). The dashboard included two components: a more general data analysis perspective and an operational HR perspective including key indicators for HR specialists to track. In contrast to the previous reactive approach, the project generated a set of readily available visualizations to inform policy making by HR specialists and other agencies in Luxembourg's government.

Before the project's implementation, the legacy HRMIS only considered the management of careers and salary computation. The project expanded the set of modules in the HRMIS, including performance and training modules. The simplified diagram presented earlier in figure 9.5 shows the main applications and the workflow of the solution. The HR BICC integrates multiple databases and dashboard applications, each tailored for different use cases, including HR specialists, employees, and citizens.

Note that in figure 9.5, the DataRH portal (in orange) is fed by multiple databases beyond the HRMIS itself. Its data pipeline includes more strategically oriented databases, such as the strategic workforce planning application. This tight integration between databases designed for strategic workforce planning and the HRMIS data promotes a strategic orientation for the HR BICC.

ROLLOUT STRATEGY AND REFORM SEQUENCE

In mid-2016, the initial decision was made to develop the HR BICC (table 9.2). In October of the same year, the project was formally launched. The first step was procurement and the launch of data warehouse deployment. The CGPO identified a business intelligence (BI) team that would be responsible for the implementation of the dashboard. After completing the selection process, the CGPO opted to hire an in-house team that had developed a similar solution in another, non-HR area within the government. It therefore opted against procuring the BI tool externally, in contrast to the Brazil HRMIS case study.

FIGURE 9.8 Sample Dashboard from Luxembourg's HR BICC



Source: Screenshot of HR BICC dashboard, CGPO.

Note: CGPO = State Centre for Human Resources and Organisation Management; HR BICC = human resources business intelligence competency center.

TABLE 9.2 Project Timeline for Luxembourg’s HR BICC

Period	Main steps
Mid-2016	Decision to put an HR BICC in place
October 2016	HR BICC project kickoff <ul style="list-style-type: none"> • Launch of BI tools procurement process (call for proposals) • Launch of data warehouse deployment project
February 2017	BI tool selection and deployment, start of governance process and documentation
March 2017	Setup of data warehouse architecture
March 2017	Start of dashboard production

Source: Original table for this publication.

Note: BI = business intelligence; HR BICC = human resources business intelligence competency center.

The main consideration was that the solution that had previously been deployed by the BI team would not only fit the CGPO’s initial needs but would also be scalable in the future. The skills developed by the in-house team were transferrable: they had already developed data infrastructure and a previous version of the dashboard tool in another area. This procurement strategy allowed the CGPO to capitalize on previous experience and substantially accelerate the deployment of the solution. As a result of this decision, dashboard production was initiated shortly after the BI tool was selected, in March 2017. In the same month, the redesign of the data warehouse architecture for the HRMIS commenced.

The legal framework was an important consideration for the project. The General Data Protection Regulation (GDPR) impacted both the source side of the data export routines as well as user access management. Monitoring technologies were built into the BI tool to address security concerns. Plug-in tools tracked user activity, tracing how apps, sheets, and data were used or visited by users. This allowed the CGPO both to understand how the HR BICC was used and to ensure that user access was carefully monitored.

The implementation team faced several challenges during the rollout of the project. The first was ensuring quality control of HRMIS data. Because the HRMIS was initially built to perform specific operations, such as salary computation and career management, HRMIS data were not always complete or consistent. As a result, in the initial stages of statistical analysis and dashboard preparation, the team identified missing data series and inconsistent results. To overcome this issue, the team designed a data relevance and quality review process while, in parallel, training civil servants on how to respect it. This quality review process is now part of the CGPO’s daily routines.

The second main challenge was providing technical support and a help desk for CGPO staff. The dashboard introduced a new way of working for HR internal specialists. Due to the novelty of the dashboard, internal teams had to adapt their business activities and processes to benefit from the new sources of information and ways of interacting with it. The implementation team also had to respond to new requests by users. Their responses ranged from converting legacy worksheets to operational dashboards to improving existing dashboards in response to user needs.

LESSONS LEARNED

Valuable lessons were learned in the implementation of the project. The implementation team faced data infrastructure constraints as well as pressure to deliver quick results. To address this, the team opted for a pragmatic and flexible approach to exporting data from the HRMIS data warehouse. This meant simplifying extraction to a few data pipelines that would clean and load the HRMIS data to the HR BICC itself.

Another lesson was the importance of data quality and how to establish processes to protect it. The team defined a data glossary to establish a common understanding of expectations regarding data structure and shared this glossary with users. It also established data governance practices and quality checks to ensure the integrity of data fed into the HR BICC. The team implemented automated controls and routines for data entered and managed by HR departments and also conducted regular trainings and communication to increase awareness of data quality concerns.

The team also learned that standards and development guidelines improve user experience and accessibility. It designed uniform layouts, chart types, navigation practices, and colors, while documenting dashboard-development requirements. However, it also learned that end users should not be tasked with developing dashboards. Even with proper documentation, developing a dashboard is a complex task. Although BI tools can convey and promote a self-service approach, end users rarely master dashboard development without proper training. Different users may not follow the guidelines for building dashboards, resulting in heterogeneous dashboards.

A final lesson was that, while limiting the scope for end users, the dashboard development team has to remain flexible and respond to user needs. Responsibilities for the implementation team include developing new dashboards, modifying existing analyses, and generating reports. The team should consult with clients until dashboards meet end users' expectations. Finally, support systems for users are strongly recommended. A helpline proved particularly useful, with a service-desk phone number and an online form to receive and answer user questions and requests.

IMPACT OF THE SOLUTION

As a result of the project, the HR BICC provides a comprehensive and detailed view of HRMIS data across the government (ministries and administrations/agencies) of Luxembourg. It includes multiple dashboards to visualize HRMIS modules, such as career management and pensions (see figure 9.6). This dashboard ecosystem keeps growing. As of today, the HR BICC maintains over 56 streams containing 157 HR dashboards with over 2,600 sheets.⁸ In addition, it hosts 320 active users with more than 20,000 connections per year.

The HR BICC accommodates a variety of use cases. Active users are, on the one hand, internal HR specialists for whom dashboards provide a new tool to monitor and verify HRMIS data. Other users include HR managers and members of HR teams within ministries and agencies. For these users, the dashboards offer a better overview of their own HR, better control over the key dates in their HR processes, and better follow-up on their personnel.

The overall benefits of such an approach are, for all users, a gain in the quality of HRMIS data and a clear and guided HR data journey. This journey ranges from a broad overview of the HRMIS to deep dives into a particular topic, such as compensation. One example of a key daily benefit is the use of aggregated trend data to project new HR initiatives, orientations, decision-making, and negotiation arguments at the ministry level. Additionally, the HR BICC provides users with accurate and fast information, accelerating business processes and decision-making. Because some of the dashboards are shared with decision-makers at the ministry level, it helps build, improve, and adapt laws and regulations. Overall, this also increases the data literacy of government organizations.

CONCLUSION

This case study has described how Luxembourg's CGPO developed an integrated dashboard system to inform policy making. The project included both the development of a dashboard ecosystem and the necessary data infrastructure to maintain it. The solution has grown considerably since its launch, hosting over

150 applications, each with its own set of dashboards. Together, these applications cover a variety of topics, from career management and pensions to recruitment.

The dashboard ecosystem has had a considerable impact on the way HRMIS data are consumed and analyzed. It provides immediate access to information on HR that allows policy makers to make better-informed decisions. It establishes quality controls and trains civil servants to better use the platform. Dashboards also increase data literacy within ministries and among HR specialists. However, it is important to note that the CGPO relies on an in-house team with experience in developing and deploying dashboards. This means that the project rollout and implementation were both fast and sustained over time. This experience contrasts with other cases, such as Brazil, more common in developing contexts, where solution maintenance and improvement were constrained by dependency on external actors.

The case study highlights the benefits of a systematic approach to HRMIS analytics, supported by a civil service with the capacity to implement and maintain it. Not all governments have access to these human capital resources. As a result, their dashboard ecosystems may require a more limited approach. Yet beyond the technical expertise, a valuable lesson can be learned from CGPO's methodical approach. The CGPO carefully developed a systematic array of protocols and documentation to protect the integrity of HRMIS data and dashboard visualizations. This requires not a group of IT experts but a careful consideration of the bureaucratic protocols necessary to both maintain and grow the solution. This approach could certainly be replicated in government agencies elsewhere.

CASE STUDY 9.2 HRMIS CASE STUDY: FEDERAL PAYROLL CONTROL AND COMPLIANCE (BRAZIL)

Luciana Andrade, Galileu Kim, and Matheus Soldi Hardt

SUMMARY

In 2019, a public-private partnership between a federal payroll auditing team and a consulting firm resulted in the development of a novel payroll irregularity detection system. The solution included an integrated data pipeline to train a statistical model to detect irregularities as well as automated identification of violations of payroll regulations. The fraud detection system was used to assist payroll auditors in their daily work. This complementary approach enabled auditors to better detect irregular payroll entries, increasing savings and improving efficiency.

INTRODUCTION

Governments are responsible for the accurate and timely disbursement of payroll to civil servants. As the volume and complexity of payroll increase, manual approaches to quality control are not sustainable. In 2019, the Department of Compensation and Benefits (DEREB), a federal agency in Brazil, was responsible

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for overseeing over 80 million paychecks annually. To improve the process, DEREb introduced a new technology to support payroll analysts in their quality checks, which combined machine learning and automation. The Federal Payroll Digital Transformation project ultimately increased recovery rates on inconsistent paychecks and is used daily by payroll analysts in Brazil's federal government.

This case study describes how the project improved the workflow for control and compliance in payroll, a foundational module in a human resources management information system (HRMIS). Although the project had a narrow focus compared to the case of Luxembourg (case study 9.1), this limited scope enabled the development of a highly specialized solution to payroll management, analogous to the case of the United States (case study 9.3). This specialization allowed for the relatively quick and low-cost deployment of the solution. However, it also meant that the project was context specific and not necessarily scalable to other modules in the HRMIS.

Here are the key lessons from the case. First, the foundational steps of problem definition and scope were conducted through extensive dialogue with end users. Payroll analysts who would ultimately use the technology were consulted and offered input to the solution itself. Second, an iterative approach reduced risk aversion and secured buy-in from leadership in public administration. Because the payroll system was complex and the analysts themselves did not have complete knowledge of it, the team opted for gradual refinement of the solution. Finally, reliance on external actors allowed for rapid implementation, but due to this external reliance, the solution was not further developed once the intervention was finalized. In-house technical capacity was never built.

The case study is structured as follows. First, we provide institutional context about the federal payroll system. Section 2 outlines the solution. Section 3 highlights the rollout strategy for the solution. Section 4 describes risk aversion in bureaucratic organizations and how iterative disruption overcame it. Section 5 outlines the impact of the solution. Section 6 draws some lessons and cautionary observations about the external implementation of digital solutions. Finally, we conclude.

INSTITUTIONAL CONTEXT OF THE FEDERAL PAYROLL SYSTEM

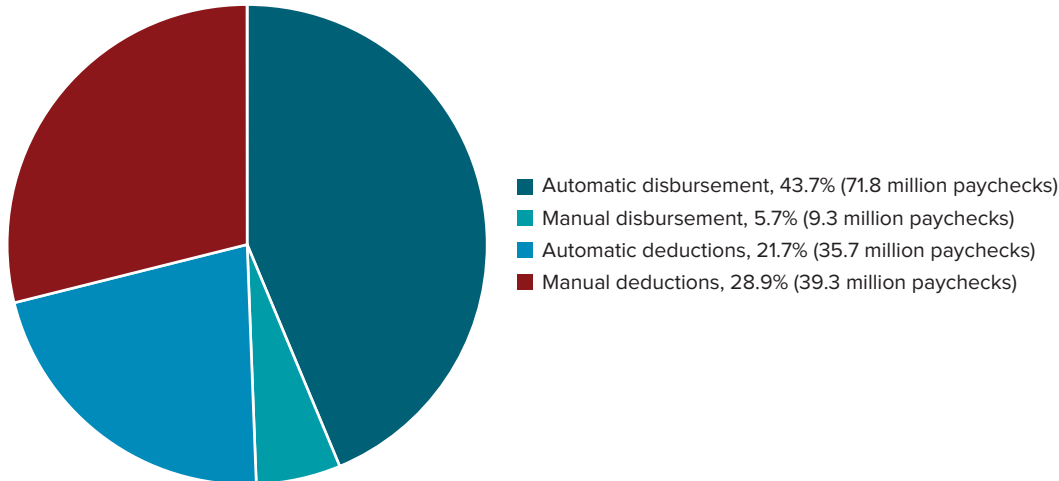
Brazil's federal government disburses over R\$150 billion (US\$30 billion) in the federal payroll every year, accounting for 1.4 percent of the national GDP in 2019. Of the total paychecks issued, over 43 percent are fully automated, meaning that payments are automatically disbursed according to pre-established rules and procedures (figure 9.9). However, 5.7 percent are still manually submitted entries, amounting to 9.3 million manual entries in 2018. While payroll data are centrally stored and managed by the Ministry of Finance, disbursement and deductions are submitted through claims by human resource (HR) departments in different federal agencies.

As noted in chapter 9, one of the foundational modules in an HRMIS is payroll compliance and control. In Brazil's federal government, payroll quality control is the responsibility of DEREb, which is overseen by the Department of Personnel Management and Performance (SGP). While it does not have the mandate to punish infractions, DEREb flags paycheck inconsistencies prior to disbursement, which must be addressed by HR departments in federal agencies.

The task is challenging. The case volume is large, with tens of thousands of individual disbursements transacted daily. Additionally, a complex set of regulations governs how payments should be disbursed. To enforce these rules and detect inconsistencies, a team of payroll analysts individually verify each paycheck. Over the course of a day, analysts check hundreds of entries to verify whether the values are in accordance with the existing rules, whether the amount issued is too high, and whether the public servant that would receive the value has the actual benefit, among other inconsistencies.

Before project implementation in 2019, payroll monitoring was done through a combination of selecting the highest-value paychecks and random sampling. At this stage, DEREb first determined the

FIGURE 9.9 Brazil's Federal Payroll, 2018



Source: Original figure for this publication.

Note: Payroll excludes the municipal government of Brasilia (GDF) and state-owned enterprises.

number of manual entries to be verified based on the productivity of each payroll analyst multiplied by the number of payroll analysts working that day. DEREb would then select payroll entries according to the following rules: 90 percent of the sample was selected from the highest-value entries and the remaining 10 percent was randomly selected. This approach was designed to reduce workload and maximize fund recovery since large entries were overrepresented in the sample.

Although this legacy approach represented an initial attempt to automate the sampling of entries for monitoring, it identified few inconsistencies. In total, only 2 percent of entries were notified for corrections, and of those, 40 percent were corrected. In total, inconsistencies that represented less than R\$10 million per year were corrected, less than 0.1 percent of the total amount disbursed by the federal payroll. Management at DEREb wanted to improve this process and opted for an HRMIS reform project in collaboration with a consulting firm.

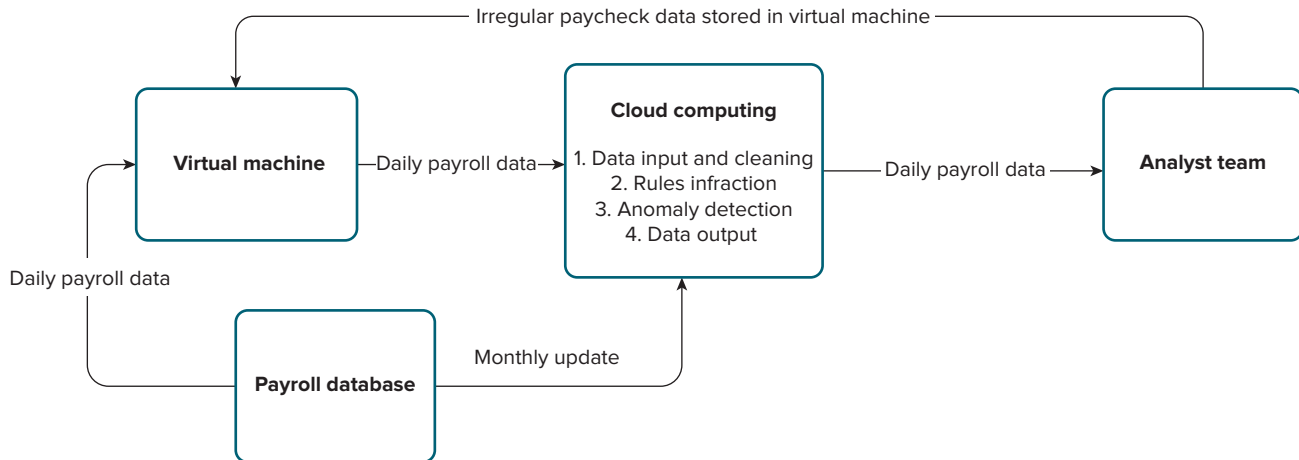
THE SOLUTION: FEDERAL PAYROLL DIGITAL TRANSFORMATION

The Federal Payroll Digital Transformation project changed the workflow for payroll quality control through the implementation of new technologies. The project was a public-private partnership between DEREb and the consulting firm EloGroup. At its core, the solution generated flags and rankings for federal payroll analysts in their effort to detect and notify agencies of potential inconsistencies in their payrolls. The solution was open source and deployed through cloud technology. The development cycle took approximately eight months to complete.

The solution relies on two complementary approaches: qualitative flagging of regulations governing payroll and quantitative analysis through anomaly-detection statistics. The development of the business-rules module relied on translating regulations governing payroll into automated flags indicating whether an infraction has occurred. The quantitative approach adopts statistical techniques developed by credit card companies to detect anomalies in payments. Payroll values that are far off from a predicted value are assigned a greater risk score and prioritized for payroll analysts.

The solution is executed daily. The first step in the pipeline is the extraction of data on paychecks created in the previous working day, reduced to the subset of manually imputed disbursements (figure 9.10). The data

FIGURE 9.10 Brazil's Solution Workflow



Source: Original figure for this publication.

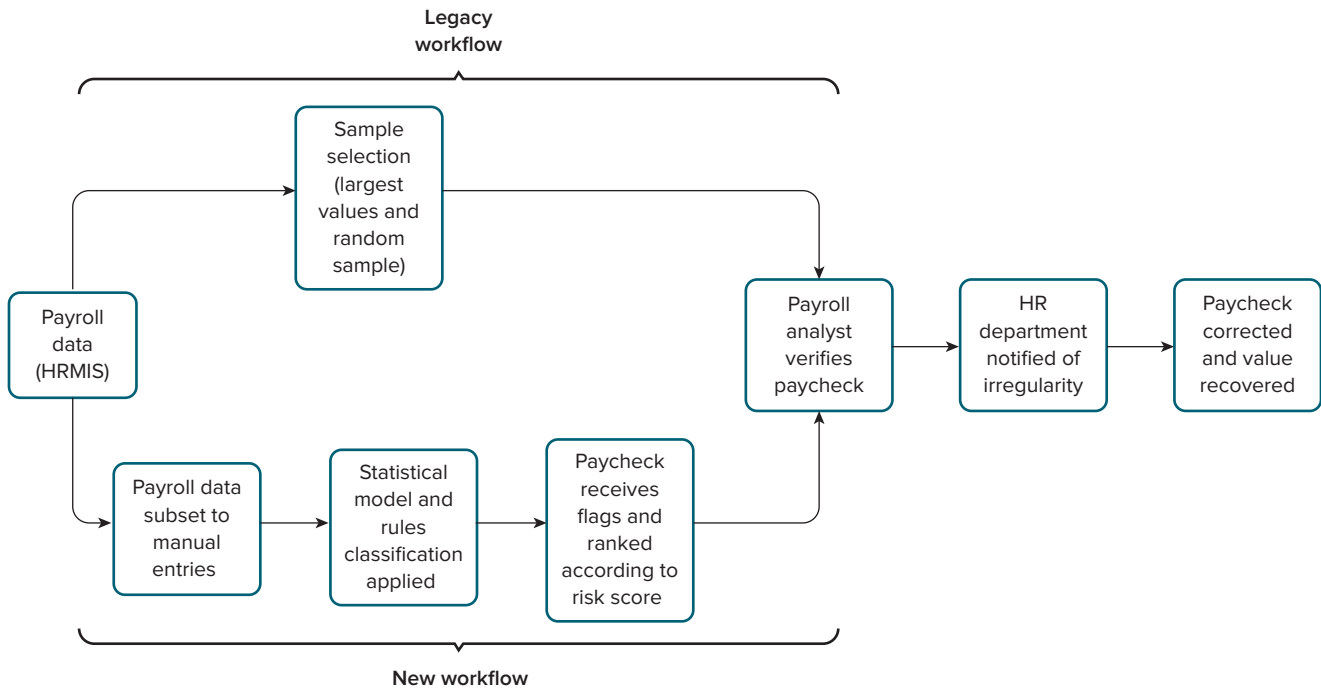
are fed directly from the payroll database into a virtual machine (VM), which receives and stores the daily payroll data. The data are then transferred to a computing cluster in the cloud, where a set of tasks is performed. The data are first cleaned and then go through a rules-infraction module, where they are flagged for potential violations. For example, one rule may be that civil servants are not allowed to claim over 1,000 reais in reimbursement for travel expenses. If the rules-infraction module detects claims that exceed that threshold, it would flag that paycheck and send it directly to the payroll analyst team, indicating that this rule has been violated. If no rule infractions are detected, the paycheck is fed into a machine-learning model that classifies paychecks as anomalous, attributing to them a risk score.

Once the business rules and the statistical model classification are applied, paychecks that are considered most likely to be inconsistent are ranked first and sent to the analyst team. The format in which the data are exported is a simple worksheet, with predetermined labels identifying the risk score and the rule-infraction flags, as well as usual paycheck fields, such as issuing agency and beneficiary. Payroll analysts have discretion over which paychecks to verify and can rank paychecks according to priority, regardless of the classification exercise. It is only at this stage that paychecks are verified and flagged for additional verification by the issuing agencies. Note that the decision to issue a flag remains under the jurisdiction of the analyst.

As a result, the workflow from the analyst's perspective has not changed significantly. The value added is curated information for the analyst, through automated rule-compliance flags and risk scores to facilitate the analyst's decision-making process. Each step in the solution workflow outlined in figure 9.10 is an additional layer of verification, which transparently encodes how the data are cleaned and classified before reaching the analyst's visual dashboard. This choice of design was agreed upon by the monitoring team and the data science team, who opted to make insights from the solution accessible and easy to use. Figure 9.11 compares the new approach with the legacy one.

The machine-learning model and the rules classification do not replace the monitoring team—rather, they enhance its workflow by automating procedures before the data even reach the individual analyst. This complementarity between analog and digital processes is what enabled the new workflow to be well received and adopted by analysts, in contrast to other experiences of technological innovation in which human decisions are eliminated. This hybrid solution provides a more gradual approach toward the goal of digital transformation, accommodating the need for preserving human autonomy while increasing humans' productivity through the use of technology.

FIGURE 9.11 Comparison between Brazil’s Legacy and New Payroll Workflows



Source: Original figure for this publication.
 Note: HR = human resources; HRMIS = human resources management information system.

ROLLOUT STRATEGY AND SEQUENCING

The director of DEREb decided to improve the existing monitoring system by leveraging the use of digital technologies. Given the agency’s capacity constraints and lack of familiarity with technological innovation, the director outsourced the implementation and rollout strategy for the solution to an external consulting firm. The initial legal groundwork was crucial. The director of the consulting firm EloGroup leveraged its experience in the development of digital technologies for other government agencies and guided the drafting of the proposal. The General Coordinator for Special Projects of the Secretariat of Public Policies for Employment was familiar with the regulatory process and provided guidance on obtaining legal approval and initial funding for the solution.

The political environment was favorable for the project. Senior leadership was committed to fighting inefficiency and possible cases of corruption, and the federal payroll was under scrutiny due to its large size and perceived inefficiency. The SGP leadership team gave wide discretion to DEREb regarding the HRMIS reform to be enacted. This autonomy allowed the director of DEREb to make difficult decisions regarding personnel, who initially resisted modifying the existing monitoring process. To obtain funding for the project, the team submitted a project proposal to a technology company that provided seed funding for the project.

The monitoring system was developed by a small but agile team of technology consultants at the consulting firm EloGroup. The initial goal was to design a prototype of the workflow outlined in figure 9.10 to detect inconsistencies that would validate the approach. An intensive consultation process preceded the implementation of the technical solution. Workshops and open discussions with federal agencies highlighted what data would be available to develop the prototype, what unique identifiers there were for merging the data, and what kinds of variables would be available to the machine-learning algorithm. An initial workshop covered

problem definition and project scoping, defining how the solution would be embedded into the monitoring tasks performed by the auditors.

Once the project was launched, it faced resistance from staff. Personnel within the monitoring team at DEREb expressed concern regarding the proposed solution because they feared displacement and the disruption of existing procedures. Staff also worried that the digital update would lead to a technological dead end, as had occurred in previous collaborations with external consulting firms. Anecdotally, there was a perception among participating Brazilian public servants that private initiatives introduced off-the-shelf solutions without considering the needs or opinions of public servants who had worked for years in the area.

A collaborative design aimed to assuage these concerns. During the kickoff workshop with multiple federal agencies, staff from different areas within DEREb were able to express their views on the flaws and strengths of the payroll system. On more than one occasion, a public servant in one area identified that his challenge was shared across departments. These open conversations made even the most reluctant employees of the project express interest, or at least not boycott the initiative. In making these concerns transparent and sharing them in an open forum, the team included payroll analysts in the development of the project. Obtaining buy-in within and across departments proved crucial to the success and sustainability of the solution.

Buy-in was necessary not only for personnel but for upper management as well. Due to budget constraints, Brazil's federal bureaucracy had only limited access to cloud resources, for which agencies needed to petition. As a result, after the initial seed funding was spent, it was necessary to secure access to cloud computing through a formal project proposal. To do this, the team presented the results of the initial stage of the solution, highlighting the benefits of the approach and how it could assist the government in saving money. This effort was ultimately successful, securing additional funding to complete the solution.

RISK AVERSION AND ITERATIVE DISRUPTION

Bureaucratic agencies are risk averse, and with good reason: they perform key roles in government and, while doing so, comply with rules and regulations. A task executed improperly or failure to abide by existing norms can have severe consequences, both for the general functioning of the state apparatus and for the individual careers of civil servants. The solution for this project was not to revamp the regulatory framework or standard operations. Instead, the reform team identified small opportunities to improve the workflow of the analyst team through multiple cycles of disruption.

Coordination was key to this approach. The consulting team was responsible for implementing the solution in terms of software and data engineering. Meanwhile, the payroll analysts and the management team at DEREb provided feedback and prototyped beta versions of the solution. To strengthen this partnership, communication channels between both teams were reinforced. The method deployed for the development of the solution was short but agile.

One of the main challenges in implementing the solution was a mutual lack of knowledge between DEREb and EloGroup regarding the other's area of expertise. For the consulting team, the payroll data and governance structures of Brazil's federal bureaucracy were so complex that most of their initial effort focused on learning how the payroll system operated. To address this, the consulting team had to communicate extensively with the monitoring team at DEREb to ensure that relevant data were extracted and that regulations were incorporated into the automated rules and statistical model.

On the other hand, the monitoring team at DEREb had limited exposure to statistics and software development and therefore needed to be introduced to novel techniques without prior knowledge. Conversations

revolved around how to formalize the substantive knowledge of analysts in software, but ultimately, analysts had to rely on the consulting team to implement the solution. Lack of familiarity with software development and the platform meant that when bugs in the operations were identified, the consulting team had to address them, and workflow was interrupted.

With the initial data pipeline designed, the business rules and the statistical model were put into production. Anomalous paychecks were sent directly to the monitoring team for validation. The initial results were positive, with the algorithm-empowered monitoring consistently outperforming the previous approach, based on the size of paychecks. As additional resources were necessary to expand the project, the director of DEREb presented the results to government leadership as promising evidence that the approach was correct. This initial buy-in proved key: having an actual solution in production and demonstrating results reduced uncertainty in higher levels of management.

The deployed solution combines two key insights: first, it formalizes existing laws and regulations governing payments in an automated pipeline. This means that the analyst no longer has to verify whether a paycheck complies with regulations; the business-rules module does this automatically. Second, the anomaly-detection algorithm relies on statistical modeling to leverage information about public servants, their departments, and their payment histories. This process fully leverages the information methodically collected by the Brazilian government on its payroll and public servants without imposing additional burdens on the analyst team.

Additionally, the current algorithm is designed to reduce workload and help analysts prioritize paychecks with higher risk. This complementary approach to improving payroll analysts' workflow is key: after initial resistance regarding these changes, the monitoring team realized the benefits of the new digital approach over previous approaches. This hybrid model, incorporating both analog and digital processes, can provide a template for public sector technological innovations.

IMPACT OF THE SOLUTION

The clearest gains from the solution were in efficiency: despite the reduction in personnel, performance increased. Due to staff attrition unrelated to the project, the team of payroll analysts had been reduced in size. Despite this reduction, the reduced analyst team could flag the same amount of resources as inconsistent compared to a larger team, while dedicating less time to each task. This reduction in the cost and maintenance of performance was an important selling point to other departments within the federal bureaucracy, highlighting the gains in efficiency from technological innovation.

An unintended consequence of the project was an increase in data literacy and a change in mindset. Users of the dashboard displayed greater interest in learning how the solution was implemented, with analysts expressing willingness to learn how to code to better understand the data. This growth in data literacy resulted from initial exposure to a set of techniques that had not been available before. Additionally, because of data integration, new linkages were formed between DEREb and other departments in the bureaucracy. Because the solution relied on data generated in other departments, there was a need for communication and transparency to make it work.

Finally, there was a shift in mindset regarding how to monitor payrolls. While previously, analysts had relied on their accumulated experience and intuition, the solution complemented this approach by emphasizing the use of data and regulatory infractions. The analytical framework of the solution provided a new template that analysts could use to assess whether a paycheck was indeed inconsistent. In a sense, the new technology changed the way payroll analysts approached their task.

SUSTAINABILITY OF EXTERNAL IMPLEMENTATION

External solutions are brittle. They introduce dependency on the technical know-how of external actors, and once the engagement is finalized, the beneficiary is no longer able to maintain or improve on the external solution. In this case, technical know-how—including software and data engineering—for the implementation of the project remained with the consulting team once it left. The analyst team at DEREB did not acquire the necessary skills or capacity to develop the solution further, even though it was open source. Although data literacy in the monitoring team increased, the analyst team was not formally trained to modify or further develop the software.

Additionally, changes in the management structure of DEREB after the implementation of the technical solution put the sustainability and continued development of the project at risk. While the previous director locked in the current version of the solution, it has not evolved since. Turnover in management and a contract-based approach meant that desirable additions to the solution—such as the extension of automation to all HR departments across federal agencies—were never implemented. The loss of institutional leadership and the lack of in-house capacity meant that while the product survived, it did not continue evolving.

CONCLUSION

Technological innovation is disruptive, but the costs and uncertainty associated with it can be reduced by adopting a gradual approach. Risk aversion—an important feature of bureaucracies—can be overcome through communication and small modifications to existing workflows. The Federal Payroll Digital Transformation project outlined in this case study showcases this approach. Instead of a complete transformation of the payroll monitoring process, the technology focused on complementing existing workflows by payroll analysts.

A collaborative approach helped build trust in the relevance of the solution and its applicability to daily operations by end users. Iterative cycles of feedback and adaptation ensured that the algorithm proposed was appropriate to the use case and understood by payroll analysts. In addition, this reduced resistance to the final adoption of the solution. Technological disruption can thus be managed and incorporated into existing procedures, giving rise to hybrid solutions that provide a stepping stone for more extensive and intensive solutions.

While the current version of the solution has been finalized, its future development is uncertain. Due to the project's outsourcing, the necessary expertise to implement and develop the solution was not developed in-house. Technological innovation through a public-private partnership therefore comes with associated costs and benefits. There is a trade-off between the agility and rapid gains from outsourcing to external agents and the lack of development of in-house expertise to continue growing solutions. External solutions therefore generate dependency on external actors for developing solutions, lowering the likelihood of maintenance and expansion in the long run.

Finally, the implementation team has emphasized the need for spaces within public administration to incubate technological innovation. These spaces would allow for calculated risks—and mistakes—within the public sector. While the team identified and opened spaces within which the solution could grow, it is important to ensure that those spaces are already set in place. This would incentivize not only managers willing to lead innovations but also staff members, who would prove more willing to engage in changes without fear of reprisal. It would also create incentives for agencies to develop the in-house capacity for technological innovation and reduce dependence on external actors.

CASE STUDY 9.3 HRMIS CASE STUDY: EMPLOYEE VIEWPOINT SURVEY ANALYSIS AND RESULTS TOOL (UNITED STATES)

Camille Hoover and Robin Klevins

SUMMARY

In 2015, the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), within the National Institutes of Health (NIH), developed the Employee Viewpoint Survey Analysis and Results Tool (EVS ART) to extract insights from the Office of Personnel Management (OPM) Federal Employee Viewpoint Survey (FEVS). The solution relied on the creative use of worksheet software to extract and transform data to produce dashboards automatically from a single data file. Effectively, the worksheet developed by the NIDDK team integrated a data infrastructure and a dashboard into a single platform, reducing implementation costs. The tool provides valuable information for senior leadership to promote employee engagement and guide policy making.

INTRODUCTION

It is a leader's responsibility to care for the people in an organization and to create and sustain a culture where employees can flourish—one in which performance is central and employee engagement is maintained. To be successful, these values must be integrated into the function and mission of the organization, not treated as distinct or separate. To create this type of culture, leadership must secure buy-in from staff at all levels. Staff must embrace the organization's vision and emulate its core values.

It is important that the core values not just be lofty or aspirational goals but translate into action on the frontlines, where the people of the organization are doing the work. Values can and should be measured through employee engagement surveys. This measurement allows leaders to keep a finger on the organization's pulse. It is important to combine data analytics with the voices of employees to inform strategies and resource allocation and to verify whether actions are paying off. Employee feedback must inform and orient action, whether in the form of focus groups, town halls, stay or exit interviews, or crowdsourcing.

This case study describes how the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) developed an analytics dashboard to measure and promote employee engagement. The project was named the Employee Viewpoint Survey Analysis and Results Tool (EVS ART). EVS ART provided NIDDK leadership with immediate and informative data analytics on their employees' perceptions of whether, and to what extent, conditions characterizing a successful organization were present in their agencies. Using EVS ART, the NIDDK was able to transform the enormous amount of data provided by the United States Office of Personnel Management (OPM) Federal Employee Viewpoint Survey (FEVS) into a user-friendly format in mere minutes. The survey topics, in response to which employees candidly shared their perceptions about their work experience, organization, and leaders, covered employee engagement, employee satisfaction,

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and several submeasures, including policies and practices, rewards and recognition, opportunities for professional development, and diversity and inclusion—all of which were used to inform decision-making.

EVS ART is an example of human resources management information system (HRMIS) analytics, similar in purpose to the case study of Luxembourg (case study 9.1). However, in contrast to Luxembourg, which generated analytical insights on the entirety of its HRMIS, this case focuses on the employee engagement module within an HRMIS. This module is diverse and expansive as a result of the rich data provided by the FEVS. The FEVS measures employees' perceptions of whether, and to what extent, conditions characteristic of successful organizations are present in their agencies. It is a survey in which employees can candidly share their perceptions about their work experiences, organizations, and leaders. EVS ART therefore includes indicators on employee satisfaction, global satisfaction, compensation, and organization, as well as more customized questions about remote work and COVID-19. The focus on improving a particular module of an HRMIS makes this case similar to the approach in Brazil (case study 9.2), which reformed how the payroll module operated.

The project provided a set of lessons that may be helpful for practitioners. First, keep the solution simple. While the inner workings of a tool itself may venture over to the complex side, do not make the act of engaging with the analysis complex for the user. Second, make the solution accessible to all types of users. This means two things. One, ensure that the tool is accessible to those with disabilities, and two, make the tool available to the broadest audience possible. If people do not know about the tool, they will continue to spend unnecessary time recreating analyses and will not obtain insights from the data. Finally, remember that transparency ensures that data analytics can be trusted by those it benefits. When working with data, leadership should not shy away from difficult conversations, because survey takers already know whether something is working well or not. It is incumbent on leadership to be honest, dig deeper, and let staff know that their input will drive organizational change.

This case study is structured as follows. We first describe the institutional context, with particular attention to the FEVS, the largest civil servant engagement survey in the United States. Section 2 explains the initial rollout of the solution. Section 3 provides a detailed overview of the solution. Section 4 outlines the lessons learned during the implementation of the project. Section 5 describes the impact of the solution. Section 6 reflects critically on the importance of looking beyond analytics and effectively promoting change. Section 7 reviews challenges faced and future improvements to EVS ART. Finally, we conclude.

INSTITUTIONAL CONTEXT: THE FEVS

Each year, the OPM administers the FEVS to over 1.4 million full- and part-time permanent, nonseasonal employees governmentwide.⁹ The FEVS measures employee engagement, including employees' perceptions of whether, and to what extent, conditions characterizing successful organizations are present in their agencies. It therefore provides valuable insight into agencies' strengths and opportunities for improvement. In 2020, 44.3 percent (624,800) of those receiving the FEVS completed it—each spending, on average, 25 minutes to do so (OPM 2021). This translates to over 260,000 federal hours and equates to over US\$10 million worth of staff time taking the survey.¹⁰

The FEVS provides valuable information because the OPM proactively designed the FEVS to include multiple index measures and key categories, such as employee engagement and satisfaction, to help agencies identify important patterns and themes.¹¹ Each index is valuable, aggregating multiple answers.¹² While much can be learned from the index measures and key categories, on average, there is a three- to four-month period during which the OPM processes the raw data before distributing it to agencies.

The FEVS allows agencies to obtain valuable feedback from all levels of the organization. Subgroups within an agency that have 10 or more survey participants can receive their own area-specific results, and those with fewer than 10 participants roll up to the next level of report to ensure at least 10 responses. This protects the confidentiality of the survey respondent, which is crucial when the goal is to obtain honest

feedback (NIH 2018). In 2018, over 28,000 organizations within the federal government had 10 or more survey participants, for a total of over 280,000 survey respondents—and the number continues to grow (Kamensky 2019).

The FEVS's granular and large-scale data allow organizational leaders within the federal government to tap into the perspective of those on the frontlines and learn from the voices of employees. In turn, the same information can be used to design employee-informed programs and initiatives. It is important for staff to be made aware of changes informed by their feedback. Informed change is noticed, creates ownership, and leads to increased engagement—and engagement is the foundation on which successful missions are built.

Despite this valuable information, extracting insights from the FEVS and putting them into action is challenging. Once given access to the survey, government agencies spend weeks culling large amounts of data to operationalize the survey's feedback. This effort is extremely labor intensive, time-consuming, and costly. Some agencies spend thousands of dollars on manpower or on procuring outside support to analyze the data. In addition, by the time the results are received and the analysis completed, agencies are often on the heels of the next survey—with little time to act on the feedback provided. It is difficult to launch meaningful initiatives with old data, and the lack of timely action, or perceived inaction, often leaves employees wondering whether taking the survey is of value.

INITIAL ROLLOUT

A small team at the NIDDK, within the National Institutes of Health (NIH), took it upon themselves to work with the data and create a framework to deliver results quickly, accurately, and intuitively. The NIDDK's senior leaders appreciated the importance of these data and made it the highest priority to construct a way to translate them. They fully supported the NIDDK team's efforts—giving them time, flexibility, and necessary resources.

The NIDDK team set out to design a tool that brought to life the voice of the people, one that was unlike other tools. As analysts, they wanted to ensure that users could arrive at actionable data quickly. However, they approached it differently from a traditional report. It was important that the tool was easy to look at, that the flow of information made sense, and that it told a story. They also wanted to ensure that actionable target areas—and themes—jumped out at the user. It was of great importance that the tool be both easy to use and accessible to all federal employees.

The team worked for two years to create a tool that would enable leaders to drill down and compare data, have a better pulse on engagement levels, and view FEVS scores in an actionable and targeted way. They began by utilizing a resource that they already had at their fingertips, a common program used across the federal government: Microsoft Excel. The team worked to design an easy-to-use template that provided a report with an easy-to-understand flow, and they ensured that the templates were password protected so that links could not be broken and results would not be compromised. The team also worked to ensure that the tools and associated resources followed the guidelines of Section 508 of the Rehabilitation Act.¹³

OVERVIEW OF THE SOLUTION

The team created the EVS ART—an Excel-based tool that allows users simply to copy data provided by the OPM and paste them into a similarly formatted template. Upon clicking “Refresh,” users can review conditionally formatted results, thoroughly compare prior years' data, and conduct a deeper-dive analysis of their outcomes.

EVS ART is different from other tools available to analyze FEVS data because users can arrive at actionable data quickly: the tool and output are easy to look at, the flow is intuitive, and the tool tells a story in a way that allows actionable target areas—and themes—to jump out. It is designed to be easy to use: it requires only basic Excel knowledge, it generates a user-friendly dashboard, and it captures and displays all OPM index measures and key categories.

The tool's utility lies in its simplicity of use but power in transforming massive amounts of information, allowing leaders to home in on important themes and compare prior years' data. EVS ART was designed so this can all be done in a few steps and as little as five minutes. EVS ART pulls data points from each of the main themes in the FEVS, such as employee engagement and global satisfaction. The tool organizes the survey results based on those themes by agency, subcomponent, and office, and it shows the change in responses for a specific item from year to year. This allows NIDDK senior leaders to monitor progress and evaluate the impact of strategies and interventions.

Instructions Tab

The first tab in EVS ART is the instructions tab (figure 9.12). Users enter the organization acronyms for the areas they wish to analyze and the year(s) of the results they wish to use. This information will automatically populate the headers and table titles on tabs throughout the Excel workbook.

Using FEVS data provided by the OPM, users copy and paste the information from their original FEVS data report into the corresponding EVS ART tab. No reformatting is required. This is done for each organization being compared. If prior year data are available, this step is repeated by pasting the data into the appropriate prior year tab(s). When this is completed, the user refreshes the data and EVS ART automatically populates the dashboard itself.

Dashboard Design

Upon feeding the data to EVS ART, users gain access to a dashboard that provides an overarching view of the organization's results. The dashboard delivers top-scoring questions for “positive,” “neutral,” and “negative” results, as well as the largest positive and negative shifts from one year to the next (figure 9.13). Below the charts, users are provided with a heat map that shows the average scores for each of the index measures and key categories, as well as their subcategories. This is helpful because it provides a clear visual at a high level and allows users to easily compare one organization to another.


The dashboard also provides a side-by-side visual comparison of FEVS results (figure 9.14). This helps users to determine areas of focus across the organization and identify areas that need more targeted intervention. The conditionally formatted heat-map feature uses color to show managers their highest and lowest scores and identifies areas that might be strengths or challenges for the agency or a specific office. While the dashboard shows where to start looking, the information behind it—in the remainder of the report—provides a path that intuitively narrows the broader topics down to specific focus areas.

Analysis Tabs

While the dashboard is a great place to start, the deeper-dive portion of the report takes the user from a general overview to more specific focus areas, where the organization's scores begin to tell a story. Figure 9.15 shows an example of an organization's percent-positive employee engagement index scores. At the top of the tab is the OPM's guidance for interpreting the results. In the case of the FEVS,

- Questions averaging 65 percent positive or higher are considered “strengths,”
- Questions averaging 50 percent neutral or higher may indicate “opportunities” for improved communication, and
- Questions averaging lower than 50 percent are considered “challenges.”

FIGURE 9.12 Instructions Tab in the EVS ART



EVS... at the heart of a healthy organization!

For use with OPM 2020 "All Items All Levels" Report

The Employee Viewpoint Survey Analysis & Results Tool (EVS ART) allows for quick, easy, and accurate analysis of Federal Employee Viewpoint Survey (FEVS) results! Something that once took hours can now be done in minutes - and in **5 simple steps** - providing valuable and actionable data for decision-making in a timely manner.

IMPORTANT: This template accommodates the revised 2020 FEVS and can be used to analyze survey's Core, Telework & Work Life questions. It is designed for use with data provided in the OPM "All Levels" report format, allows for the comparison of up to 5 organizations, and offers users the ability to conduct a year-to-year comparison for the "Primary" Org.

STEP 1: Enter Required Information:	
Organization 1 Acronym (for Governmentwide or other comparison Org)	Dept A
Organization 2 Acronym (for Department or other comparison Org)	Agency B
Organization 3 Acronym (for Agency or other comparison Org)	Division C
Organization 4 Acronym (for Office or other comparison Org)	Branch D
Organization 5 Acronym (for Primary Org being analyzed)	Section E
Current Year (Do not change from 2020)	2020
Prior Year (When comparing prior year data for Org 5/Primary Org)	2019

STEP 2: Enter Participation Rates and/or Custom Message

Enter Participation Rates and/or Custom Message

STEP 3: Copy & Paste 2020 Data

ACTION: Open the OPM 2020 FEVS "All Items All Levels" report for the organization(s) you wish to analyze.

Follow the instruction at the top of the "2020 Core Questions" and "2020 Telework & Work-Life" tabs below to copy and paste information from the OPM 2020 FEVS "All Items All Levels" report to this EVS ART template.

RESULT: The Dashboard, Positive, Neutral, Negative, and Telework & Work-Life worksheets will autofill with 2020 survey data.

STEP 4: Copy & Paste Org 5/Primary Org PRIOR Year Data (if available)

ACTION: Open the PRIOR year FEVS "All Levels" report that you wish to use to do a year to year comparison for Org 5.

Follow the instruction at the top of the "Org 5 PRIOR Year Data" tab below to copy and paste information from the prior year OPM FEVS "All Items All Levels" reports to this EVS ART template.

RESULT: The Dashboard, Positive, Neutral, and Negative worksheets will autofill with Org 5's PRIOR year survey data.

STEP 5: Activate the Dashboard!

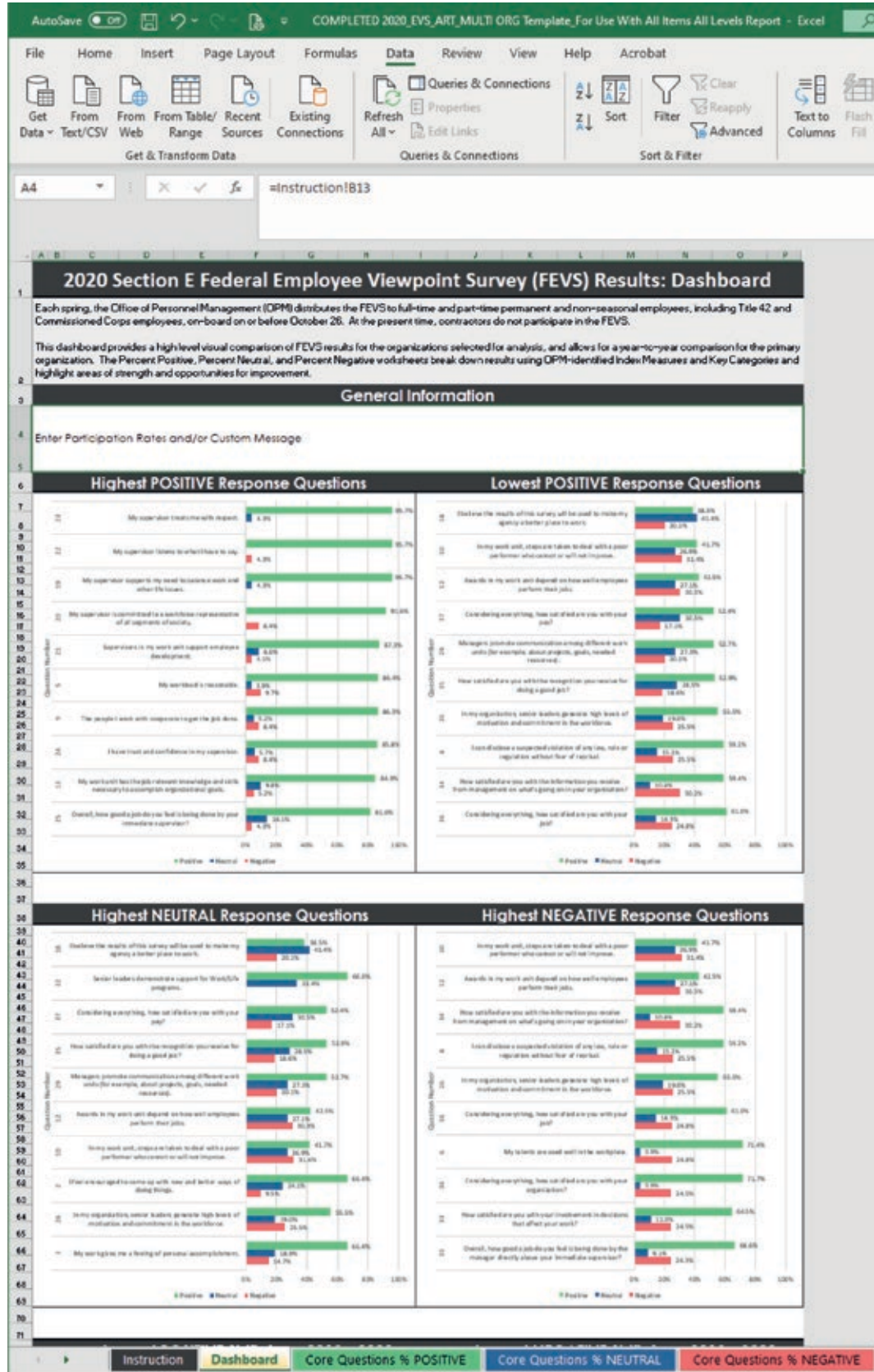
ACTION: Click the "Data" tab in the toolbar above and select "Refresh All". Then go to the "Dashboard" tab to begin reviewing your 2020 results.

RESULT: The Dashboard graphs and heat map will autofill with the 2020 results. When prior year data is present, the largest positive and negative shifts will be shown and the difference between 2020 and prior year will be reflected in the heat map.

Source: Screenshot of EVS ART 2020, NIDDK.

Note: EVS ART = Employee Viewpoint Survey Analysis and Results Tool; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases; OPM = Office of Personnel Management.

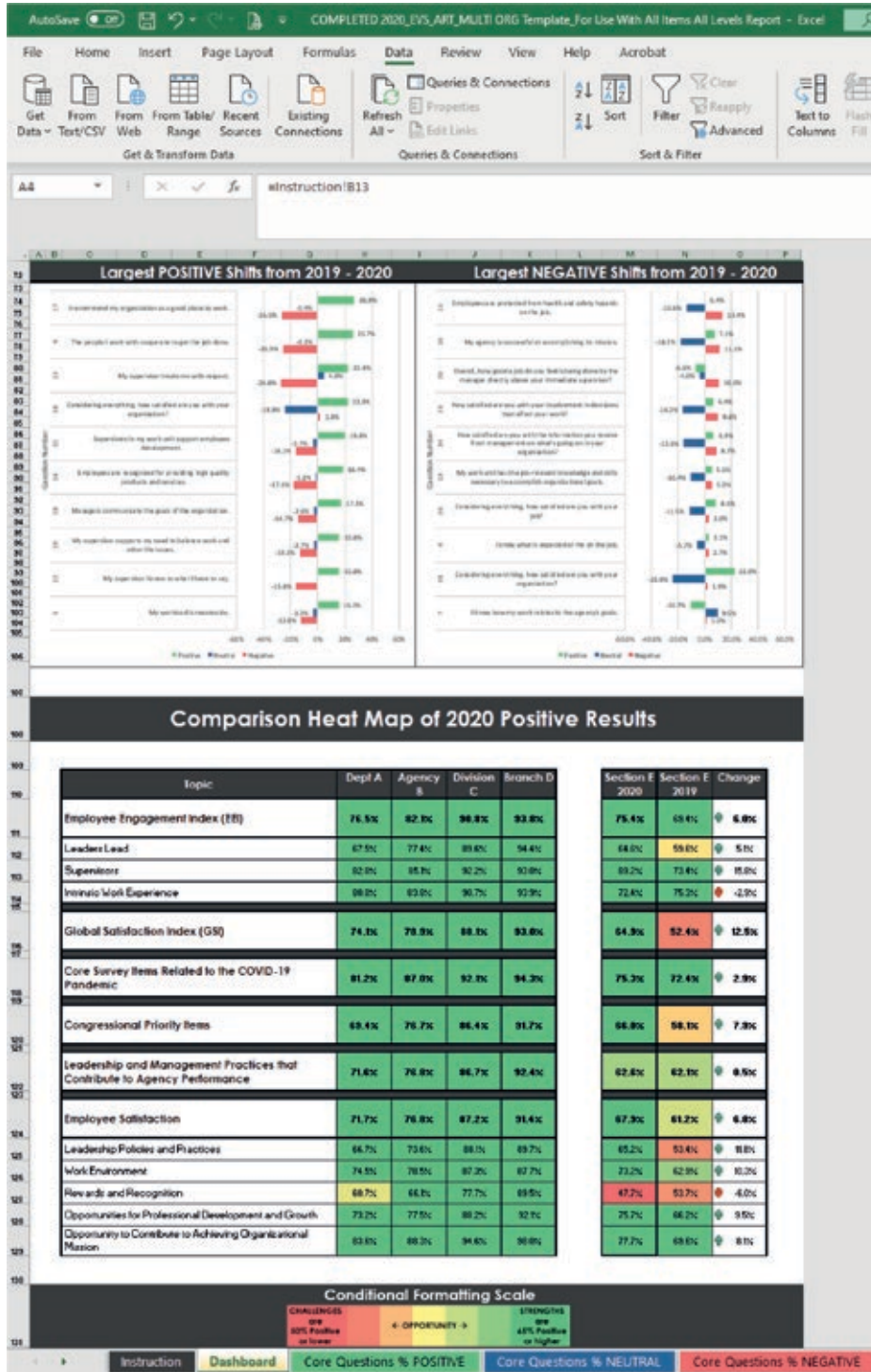
FIGURE 9.13 Landing Page of the EVS ART Dashboard



Source: Screenshot of EVS ART 2020, NIDDK.

Note: EVS ART = Employee Viewpoint Survey Analysis and Results Tool; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases.

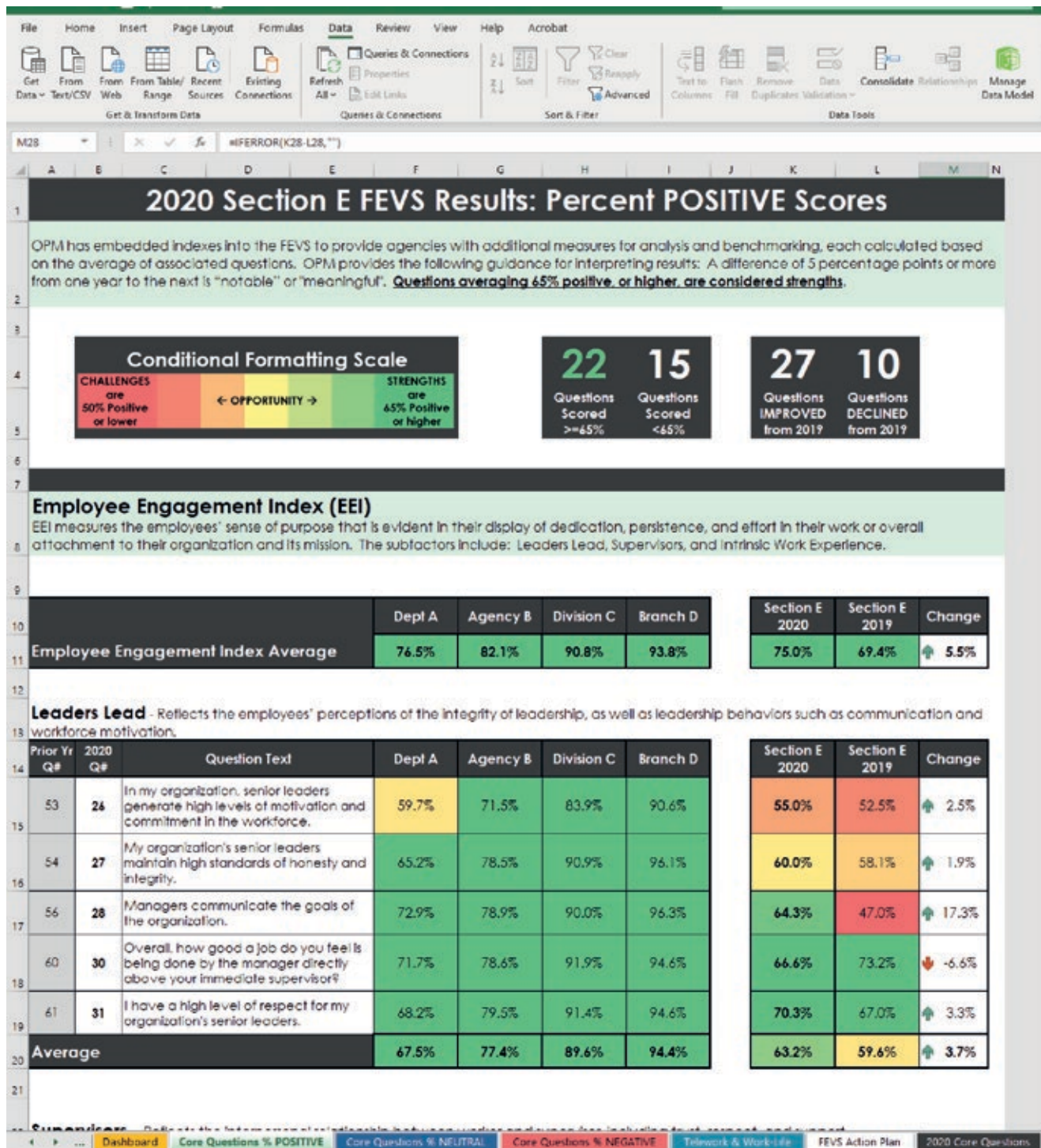
FIGURE 9.14 Results Comparison in the EVS ART Dashboard



Source: Screenshot of EVS ART 2020, NIDDK.

Note: EVS ART = Employee Viewpoint Survey Analysis and Results Tool; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases.

FIGURE 9.15 Percentage of Positive Employee Engagement Scores from the Federal Employee Viewpoint Survey

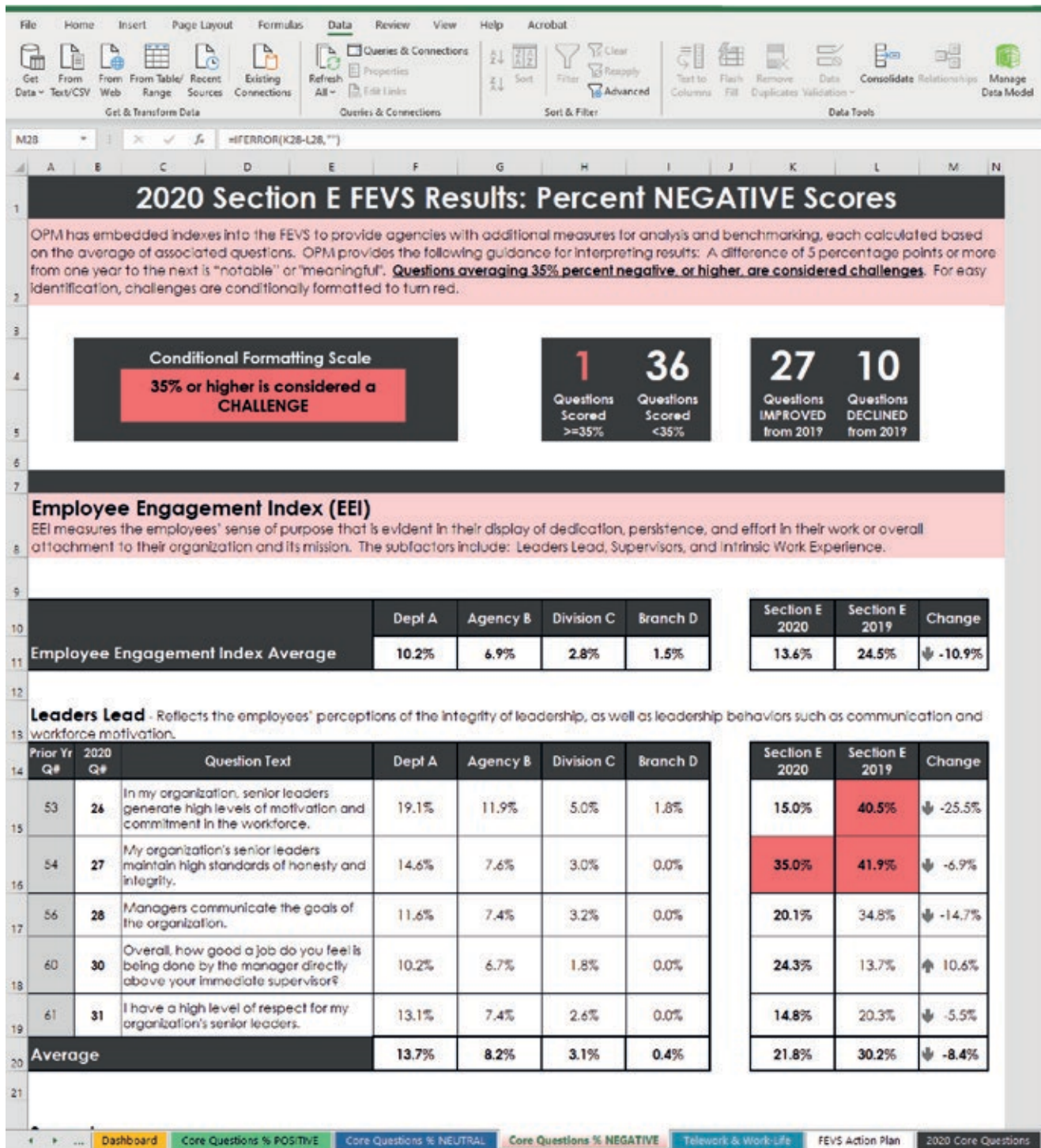


Source: Screenshot of EVS ART 2020, NIDDK.

Note: EVS ART = Employee Viewpoint Survey Analysis and Results Tool; FEVS = Federal Employee Viewpoint Survey; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases; OPM = Office of Personnel Management.

EVS ART is conditionally formatted so that themes are easily identified. Users do not have to know how the tool works to be able to interpret the story or determine where they need to focus, where they have strengths, and where there are opportunities for improvement.

FIGURE 9.16 Percentage of Negative Employee Engagement Scores from the Federal Employee Viewpoint Survey



Source: Screenshot of EVS ART 2020, NIDDK.

Note: EVS ART = Employee Viewpoint Survey Analysis and Results Tool; FEVS = Federal Employee Viewpoint Survey; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases; OPM = Office of Personnel Management.

It became clear that one should look beyond whether scores are positive or not. Often, federal leaders focus solely on questions that average 65 percent positive or lower. While this is important, going beyond to review both neutral and negative scores can provide clarity (figure 9.16). For instance, there is a big difference between a *low positive score with a high neutral score* and a *low positive score with a*

high negative score. While a low positive score is not preferable, if it is paired with a high neutral score, it could indicate an opportunity for communication and clarification, whereas a low positive score paired with a high negative score clearly indicates a problem area.

Action-Planning Tab

Effective action planning can transform data into meaningful change. The EVS ART action-planning tab is designed to help initiate the process and determine next steps (see figure 9.17). After reviewing the results, users can

- Identify focus areas (these areas can align with OPM index measures and key categories or can be customized to reflect areas of interest),
- Enter related FEVS question numbers (data will automatically populate based on the question number selected),
- Brainstorm initiatives and interventions geared toward improving focus areas, considering both the potential impact and available resources,
- Designate a lead person or office to address each focus area, and
- Assign target completion dates.

Implementation and Reform Sequence

When initiating the development of the tool, the team first identified the questions that made up each of the FEVS index measures. This was a bigger challenge than anticipated because no one document contained all the information needed, so they created their own. The team scoured the OPM's FEVS technical guides going back to 2012 to identify each measure, its definition, and the associated survey questions. They compiled a master document with this information that is still in use today.

The team also faced their own learning curve. They had a creative vision of what they wanted to accomplish, what they wanted the tool to look like, and what they wanted it to do, but they did not necessarily have the expertise to accomplish it—or so they thought. So the team began to work backward, peeling back the layers of what they anticipated the final product would look like, then researching and teaching themselves how to accomplish each step along the way.

Whether it was the visual appearance and flow or the inner workings of many hidden pivot tables and charts, each task was new, each was important, and each was tackled and then painstakingly built out, tested, adjusted, and then tested again. With each success came a small victory that fueled the next challenge. The analyst team looked for gaps, identified opportunities for improvement, and created efficiencies—and this project provided all of that and more. They knew that what they were creating could feasibly make a difference in the way the FEVS was used and valued governmentwide.

Upon completion, the NIDDK team recognized that the dashboard could be useful in other contexts and decided to share it broadly. Little did they know that getting the word out and giving the tool to other departments and agencies would prove to be more of a challenge than building the tool itself. First and foremost, the creation of EVS ART began as a grassroots effort, far removed from those who managed and administered the FEVS. The NIDDK team began sharing their tool across their agency, but the department had little influence in sharing it broadly.

When the team gained the attention of the US Office of Management and Budget (OMB) and the OPM, all of that changed. The NIDDK team was invited to present to the OMB and the OPM. The OMB was impressed with EVS ART and praised the work done by the NIDDK.¹⁴ The OMB and the OPM organized a venue during which the NIDDK shared the tool with federal chief human capital officers (CHCOs) governmentwide. With the amplification of this extraordinary tool, the team received numerous requests for

FIGURE 9.17 Sample Action-Planning Tab in the EVS ART

Section E FEVS Action Plan		Survey Year: 2020						
Focus Area	Q#	Question Text	2020 Positive %	2020 Neutral %	2020 Negative %	Initiatives & Interventions	Lead/Office	Target Completion Date
	18	I believe the results of this survey will be used to make my agency a better place to work.	38.5%	41.4%	20.1%			

Source: Screenshot of EVS ART 2020, NIDDK.
 Note: EVS ART = Employee Viewpoint Survey Analysis and Results Tool; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases; OPM = Office of Personnel Management.

demonstration of EVS ART from agencies and departments outside of their own. This was a challenge in itself for the team of three because many of the organizations expressing interest in the tool were within the same agency or department but siloed from one another, resulting in multiple requests from each. Additionally, due to turnover in political leadership, there were requests to return to organizations to share with new leaders the capabilities of EVS ART and the progress recognized by the NIDDK when their FEVS results were used to inform change.

The enormity of the US federal government made it more and more difficult to manage such requests. The NIDDK team established an online presence, which allowed federal employees to access the tool and

its training resources. The OPM also offered EVS ART as a resource to agencies and departments as part of work being done under the President’s Management Agenda. The collaboration between the NIDDK, the OPM, and the OMB blossomed, and since 2017, the NIDDK team has conducted hundreds of presentations, trainings, and customized workshops that have reached personnel in each of the 15 executive departments. These meetings and training sessions continue because the team has found that organizations at all levels within departments are interested in learning about successful practices.

It was important to the team that other federal employees knew of EVS ART’s availability, and equally important that they benefited from it, but it was also important that no outside entity unduly profit from its use. EVS ART was created by federal employees, for federal employees, using resources readily available and with no contractor support. Realizing its benefit and potential, the NIDDK elected to share its tool with any and all federal entities expressing interest, free of charge. Its view as a steward of federal funds was that it had done the work and, by sharing its tool, others could avoid duplicating its efforts and could create extraordinary efficiencies within their own organizations. Many organizations had spent weeks, if not months, and sometimes thousands of federal dollars on outside consultants to do what they could now do for themselves in minutes using EVS ART. The NIDDK has received numerous requests from outside vendors and consultants related to the use of its tool in support of work they are doing for other federal organizations—and even requests for unlocked versions that they can modify for their own use with federal clientele. This goes against the grain of the NIDDK’s vision for sharing the tool at no cost. The team does not want federal funds to be used, perhaps unknowingly, to pay for a tool available for free.

Feedback, Flexibility, and Continuous Improvement

End users of EVS ART have expressed gratitude for the tool.¹⁵ Having this tool helps leadership to see data in one place, or by field office if they like. This tool gives the flexibility to do that, and quickly, economizing time. The way the analysis and reports are organized makes the data clearer, which makes for faster analysis of employee feedback and allows leadership to address the question “what now?” so that agencies can develop a plan of action based on employee responses.

EVS ART was designed to provide users with many ways to view data. It offers a dashboard, heat maps, breakouts by index measure, and bar charts. However, there is always the desire to display data in different ways. Early on when the team received requests from users to modify the tool, they provided unlocked versions to those requesting to make modifications. After seeing the inner workings of EVS ART, and the thought that went into the creation of the tool, a user remarked that “it look[ed] easier than it really is,” and this is true.

The team learned, through trial and error, that it was not wise to share unlocked versions of the tool. There are numerous pivot tables and charts and thousands of links and formulas in each of the templates. Breaking any one of them could compromise the analysis. Because of this, they decided to no longer provide unlocked versions and instead to collect the feedback received and use that information to improve the templates each year.

LESSONS LEARNED

The project taught the implementation team a set of lessons:

- **Cost does not equal worth.** A tool does not have to be expensive to provide extraordinary value.
- **Keep the solution simple.** While the inner workings of a tool may venture over to the complex side, do not make the act of engaging with the analysis complex for users, or they will not use it.
- **Make the solution accessible to all.** This means two things. One, ensure that the tool is accessible to those with disabilities, and two, make it available to the broadest audience possible. If people do not

know about the tool, they will continue to spend unnecessary time re-creating analyses and unnecessary money on contracts to conduct analyses, or they may simply do nothing with the valuable information they have at their fingertips.

- **Ensure that the output of the tool is intuitive and useful.** Do not make users reanalyze the analysis—the tool should do the work for them the first time. Provide results in a format that can be utilized for presentation.
- **Tell the story.** Do not overwhelm end users. Offer a high-level visual overview and then direct them down an intuitive path to more specific details.
- **Be transparent.** When working with results, whether positive or negative, do not shy away from difficult conversations. Survey takers already know whether something is working well or not. Be up front, dig deeper, and let them know that their input will drive change.
- **Tie actions back to survey feedback.** When creating initiatives based on feedback obtained through a survey, it is important to tie the organization's actions back to the voice of the people. This will increase engagement, add validity to the survey, and in most cases, increase future participation.

What was the most basic lesson learned? Great things can come from grassroots efforts.

IMPACT OF THE SOLUTION

The introduction of EVS ART created immediate efficiencies in both the time and cost of completing the FEVS analysis. Colleagues at the Centers for Disease Control and Prevention (CDC) experienced a significant reduction in the time spent conducting FEVS analysis. Prior to EVS ART, they produced 24 reports in 72 workdays at a cost of approximately US\$30,861. Reporting can now be done in one workday at a cost of approximately US\$1,129—a savings of US\$29,732 and a 96 percent reduction in both time and cost. These efficiencies have allowed the CDC to increase its reporting sixfold to 150 individual analyses—meaning that 126 additional managers now receive their own customized FEVS results.

An NIH analyst who once spent 30 hours creating one report at an average cost of US\$1,350 can now complete an analysis in less than 5 minutes at a cost of US\$3.75. Simplifying the analysis process means that frontline managers can access meaningful data to better inform policies, programs, and initiatives much sooner. They can also have confidence that the information they are using to create or bolster initiatives is coming directly from those whom their actions impact most.

BEYOND ANALYTICS: CREATING MEASURABLE AND SUSTAINABLE CHANGE

While the efficiencies created by EVS ART have helped save both time and money, the most important aspect, by far, has been the increased ability to identify themes and measure organizational change (see figure 9.18).

One example of a success story concerns the transformation of an underperforming organization. This organization was forward facing and interfaced with all 1,300 institute employees. To remedy its underperformance, the NIDDK Executive Officer stepped in with a multipronged approach and, over the course of a year,

- Put in place new standards and forms of accountability, including metrics to measure productivity (industry standards),

FIGURE 9.18 Identifying Challenges through the EVS ART



Source: Original figure for this publication, NIDDK.

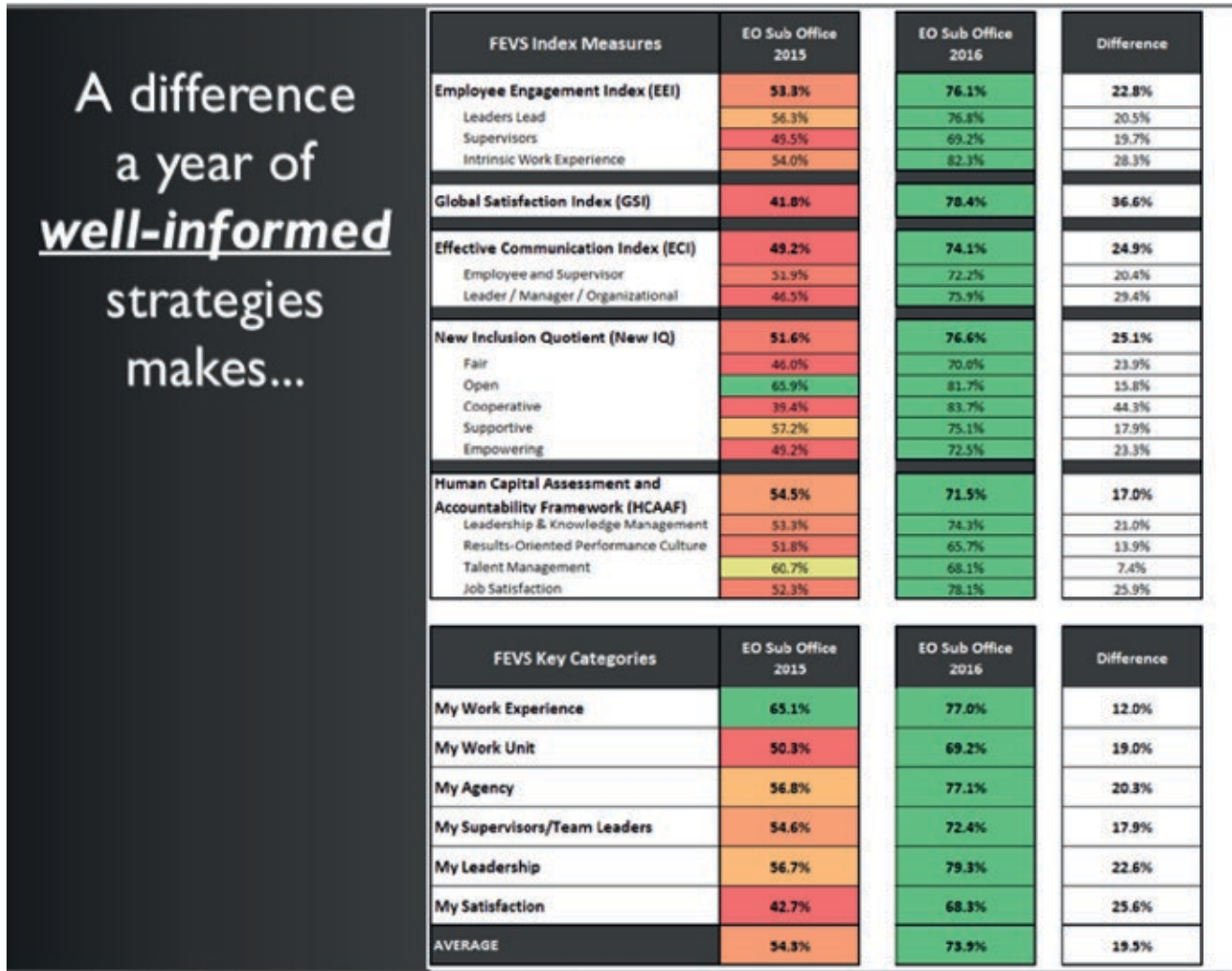
Note: EO = executive office; EVS ART = Employee Viewpoint Survey Analysis and Results Tool; FEVS = Federal Employee Viewpoint Survey; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases.

- Worked closely with leaders to create a new vision for the group,
- Changed out leaders who did not embrace the new vision,
- Taught necessary competencies to supervisors,
- Created opportunities for high performers,
- Ensured that mediocrity was not acceptable and that there were consequences for poor performance, not only for employees but also for leaders, and
- Worked closely with the employees of the organization so they knew in real time what changes were happening and why, ensuring that each employee within the organization had a voice.

Over the course of a year, the organization was transformed. Employees knew it because service improved, complaints were greatly reduced, and partnerships began to form. By using EVS ART, the NIDDK was able to prove that its targeted interventions were working. Figure 9.19 illustrates the transformation from one year to the next. The employee engagement index went up by 22.8 percentage points, the global satisfaction index went up 36.6 percentage points, and the new inclusion quotient increased from 51.6 percent to 76.6 percent positive.¹⁶

NIDDK staff recognized the transformation, and confidence in the organization returned. The work continues to pay off, and five years later, the success of the interventions is still clearly demonstrated (see figure 9.20).

FIGURE 9.19 Changes in Federal Employee Viewpoint Survey Index Measures, 2015–16



Source: Original figure for this publication, NIDDK.

Note: EO = executive office; FEVS = Federal Employee Viewpoint Survey; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases.

Performance Management in Practice

The same success has played out across the institute. In addition to targeted interventions, to be a truly performance-centric organization, performance management must be incorporated into an organization’s culture continuously. NIDDK leadership routinely finds opportunities across the institute to highlight the importance of performance standards and conversations.

At the NIDDK, people throughout the organization shared via the FEVS that they wanted discussions with their supervisors about their performance to be more worthwhile: they wanted their supervisors to provide them with more constructive suggestions about how to improve their job performance and to give them meaningful recognition when they had done a good job. To address this, the NIDDK Executive Officer initiated the following practices:

- Reviewing performance ratings across the entire organization to make sure that all supervisors were interpreting “outstanding” rating requirements, versus “excellent” and “satisfactory” ones, in the same way and that, where appropriate, they were giving lower ratings when deserved rather than ignoring underperformance

FIGURE 9.20 Changes in Federal Employee Viewpoint Survey Index Measures, 2015–19



Source: Original figure for this publication, NIDDK.

Note: EO = executive office; FEVS = Federal Employee Viewpoint Survey; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases.

- Reviewing all awards and retention incentives to make sure there was equity and fairness in who received awards and in what amounts
- Sending mid-year and end-of-year communications to the NIDDK’s supervisors, reiterating what employees had said and emphasizing that staff played an active role in their performance conversations
- Sending communications to staff reminding them that what they said was important and encouraging them to play an active role in their performance conversations
- Sharing the document “Performance Management Tips and Templates” with both supervisors and staff to equip them with the tools they needed to have more robust performance conversations.

Over time, the people of the organization saw a noticeable change in performance management, which the NIDDK has validated using the FEVS and EVS ART. Traditionally, one of the lowest-scoring questions across government has been “In my work unit, steps are taken to deal with a poor performer who cannot or will not improve.” This is one of the most difficult questions to tackle across the government. Many

FIGURE 9.21 Improving Measures of Accountability at the National Institute of Diabetes and Digestive and Kidney Diseases

Accountability...

Organization	2015	2016	2017	2018	2019	Change from 2015 to 2019
Governmentwide	28%	29%	31%	32%	34%	6%
HHS	34%	35%	38%	39%	40%	6%
NIH	39%	41%	43%	46%	46%	7%
NIDDK/EO	57%	56%	70%	73%	86%	29%

FEVS question:

In my work unit, steps are taken to deal with a poor performer who cannot or will not improve.



Source: Original figure for this publication, NIDDK.

Note: EO = executive office; FEVS = Federal Employee Viewpoint Survey; HHS = Health and Human Services; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases; NIH = National Institutes of Health.

federal leaders have said that it should be removed from the FEVS because, due to the confidential nature of employee relations, it is nearly impossible to demonstrate that actions are being taken.¹⁷

However, the NIDDK proved that it is possible. Leaders throughout the institute devoted resources to assist supervisors and employees early on when there were problems with performance or conduct. The key was creating a culture where early intervention occurs and clear standards and accountabilities are established and transparent. When this was done, staff began to notice underperforming organizations improve (see figure 9.21).

CHALLENGES FACED AND THE PATH FORWARD

The biggest challenge for the NIDDK team has been balancing their traditional responsibilities with the demands of creating, modifying, and supporting a tool that has gained in popularity. Since its inception, EVS ART has been enhanced to expand its capabilities several times due to the NIDDK's desire to strive for continuous improvement based on feedback received from users. The FEVS itself has undergone changes over the last three years, and EVS ART has required substantial modification to adapt to those changes as well. The team has learned that, while there is great satisfaction in being able to provide their federal colleagues with a tool that evolves with their needs, this also means that their work is never really done.

One function not yet incorporated by the tool’s creator is the ability of the tool to determine statistical significance in changes from one year to the next, or between organizations of similar or different sizes. The addition of this capability could help to “win over” survey cynics. Last, with the topics of diversity, equity, inclusion, and accessibility at the forefront of conversations within the United States, it would be helpful to have the ability to compare data using different demographics, such as race and ethnicity. This is something that the NIDDK team is actively working on. While not all users have access to this level of data, the team would like to provide a similar user-friendly reporting format to those who do have access.

CONCLUSION

All leaders aspire to create and sustain high-functioning organizations. How can organizations achieve high-functioning performance, much less provide measurable evidence that they have reached this goal?

The synergy between technology for data analytics and the voice of the people can be powerful. It can inform a leader’s strategy and resource allocation and provide evidence that an organization’s performance and engagement activities are paying off. The NIDDK now uses the FEVS as a launchpad for moving forward, not as a report card looking back. It is with this in mind that it put into effect the year-round campaign “You Speak ... We Listen ... Things Happen!” to reiterate to employees that it is constantly listening to their voices and taking their feedback into account in the planning of programs and initiatives. Leadership incorporates this campaign into email communications, posters, and all-hands meetings to remind employees that their voices make a difference.

The NIDDK Executive Officer also conducts workshops to build communities and connect with staff. Early on, these workshops were used as part of targeted interventions. Now, as a very high-functioning organization, the NIDDK has transitioned to more strategic initiatives. It does this by harnessing the talents of staff who have relevant interests and technical expertise that extend beyond their functional areas to deliver workshops that continue to strengthen employee development—in lieu of bringing in outside facilitators. It focuses on career development, offering world cafés that allow staff one-on-one interaction with senior leaders from across the NIH who volunteer to share experiences, as well as specialized workshops on resilience, problem solving, conducting difficult conversations, and managing up.

Another part of the NIDDK’s success has been in creating many strategic initiatives. Some of the more novel programs it has put in place, which have resulted in an increase in FEVS scores and in employee engagement across the institute, include using crowdsourcing to initiate conversations and capture ideas, incorporating pulse surveys into town halls, and conducting stay and exit interviews with staff. In addition, it has created a novel awards program to recognize “rising stars,” innovative problem solving, and personification of the organization’s core values. It has also focused on the professional and career development of staff through the launch of a formal mentoring program, a shadowing program, a new supervisors program, and the novel Career Climbers Cohort, which was specifically designed for staff who were junior in experience or brand new to the federal workforce. Each of these initiatives, programs, and activities has been informed by the institute’s employees. This largely explains the institute’s success in the FEVS’s “Belief in Action” question: “I believe the results of this survey will be used to make my agency a better place to work.” Across government, this question has traditionally scored incredibly low—but at the NIDDK, that has changed.

In 2015, the NIDDK was able to do its first deeper-dive analysis using an early version of EVS ART. Armed with this information, they set out to create employee-informed change, and this did not go unnoticed. Between 2015 and 2016, the NIDDK Executive Office’s positive responses to the “Belief in

Action” question jumped by 14 percentage points, from 52 percent to 66 percent. In 2020, this same office recognized a “Belief in Action” score that was 90 percent positive—a jump of 38 percentage points from 2014 (see figure 9.22).

With the increase in “Belief in Action” scores, survey response rates increased as well. The NIDDK’s overall employee participation increased from 36.8 percent to 74.5 percent (see figure 9.23).

Very basic things are needed to help ensure an organization’s success. An organization requires reliable and real-time data, the ability to keep a finger on its own pulse, and the ability to tie organizational interventions and strategic initiatives back to employees’ voices. Data are only meaningful when they are accounted for, acted upon, and shared with staff. They must be incorporated into the organization’s culture and practices on a daily basis. The result is an amazing ripple effect (figure 9.24).

In closing, EVS ART is an incredible resource, but it is important to remember that the tool itself cannot create change—it can only inform it. The magic lies in what is done with the information it provides. The importance of leadership buy-in and action, at all levels, is critical, and a leader’s level of buy-in can either help or hinder an organization’s success. When leaders effectively use employee feedback to create timely, well-informed, and meaningful initiatives, the rest will begin to fall into place—and that is a wonderful cycle to be in.

FIGURE 9.22 “Belief in Action” Scores from the Federal Employee Viewpoint Survey, 2014–20

Belief in Action...

Organization	2014	2015	2016	2017	2018	2019	2020	Change from 2014 to 2020
Governmentwide	38%	39%	41%	42%	41%	41%	43%	5%
HHS	47%	49%	52%	54%	55%	56%	57%	10%
NIH	46%	48%	53%	56%	59%	59%	62%	16%
NIDDK	50%	55%	69%	71%	74%	73%	76%	25%
NIDDK/EO	52%	66%	76%	83%	77%	88%	90%	38%

FEVS question:

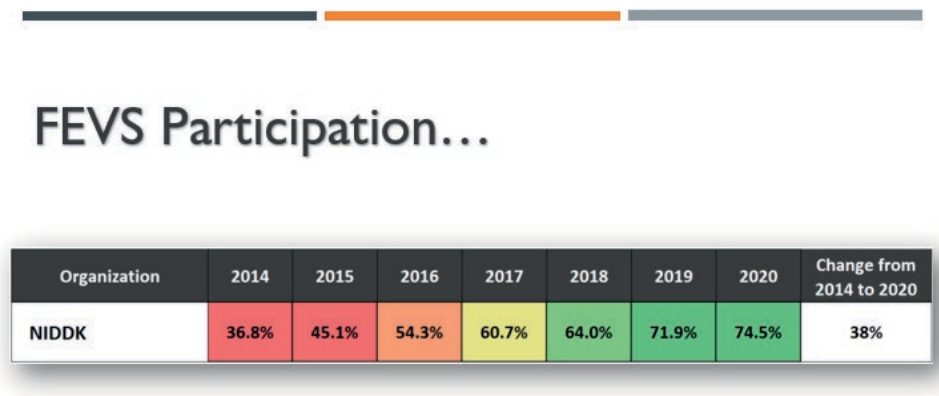
I believe the results of this survey will be used to make my agency a better place to work.



Source: Original figure for this publication, NIDDK.

Note: EO = executive office; FEVS = Federal Employee Viewpoint Survey; HHS = Health and Human Services; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases; NIH = National Institutes of Health.

FIGURE 9.23 Federal Employee Viewpoint Survey Participation Rates, 2014–20

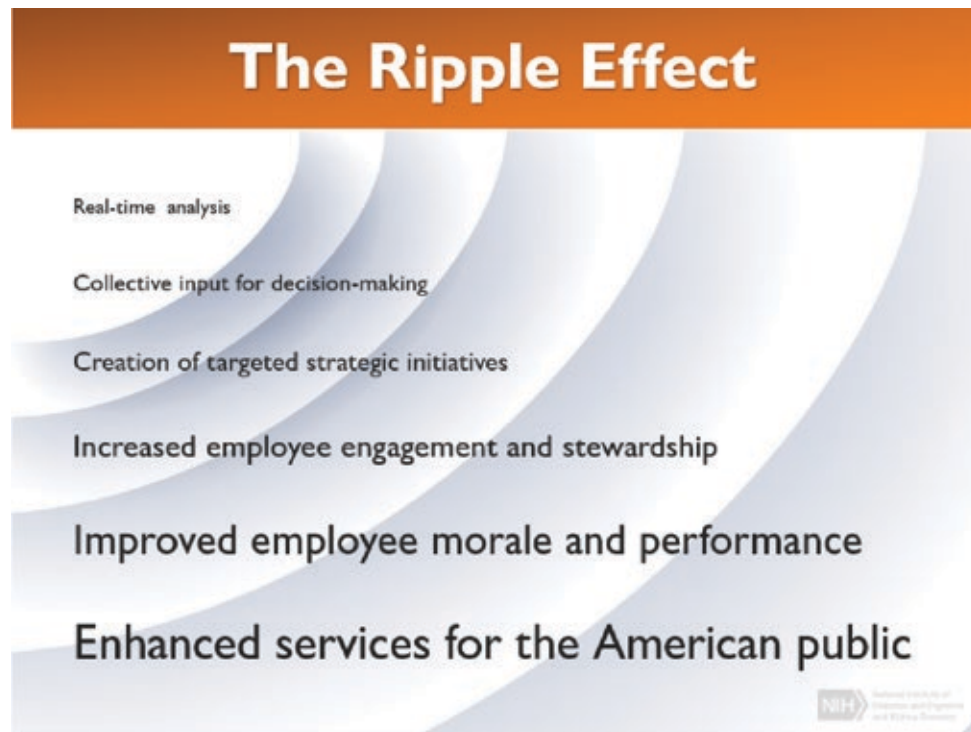


...often reflects an employee’s “Belief in Action”



Source: Original figure for this publication, NIDDK.
Note: FEVS = Federal Employee Viewpoint Survey; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases.

FIGURE 9.24 The Ripple Effect



Source: Original figure for this publication, NIDDK.
Note: NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases.

NOTES

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1. For an overview of different statistical capacities produced by the World Bank, see the Statistical Performance Indicators (SPI) page on the World Bank website, <https://www.worldbank.org/en/programs/statistical-performance-indicators>.
2. There is an important distinction between data infrastructure and information systems. Data infrastructure often entails both the digital and physical infrastructure required to store data, while the information system refers specifically to the software architecture in which data are stored.
3. For additional details, see chapter 12.
4. Ghost workers can appear in many forms: employees without a legal appointment who are nevertheless being paid; dead employees who continue to appear on the payroll and whose salaries are drawn by local administrative staff or shared with descendants; employees who draw both a pension and regular salaries; employees who draw multiple salaries from different ministries or agencies; employees who have been dismissed or have retired or resigned from service but continue to draw salaries; employees who are not working or showing up but continue to be paid; and employees who use false or multiple identities to draw multiple salaries.
5. More information about the FEVS can be found on the website of the OPM, <https://www.opm.gov/fevs/>.
6. See case study 9.3.
7. The project is described in more detail on the World Bank website, <https://projects.worldbank.org/en/projects-operations/project-detail/P176877>.
8. A sheet is a page that contains the charts, key performance indicators, and tables that compose a dashboard. An application contains multiple sheets.
9. More information about the FEVS can be found on the website of the OPM, <https://www.opm.gov/fevs/>. For summary statistics on full-time permanent, nonseasonal federal employees, see OPM (2017).
10. This staff time estimate does not include the time spent administering the survey or analyzing its results.
11. Index measures are aggregates of positive questions regarding perceptions of employee engagement. Key categories are generally described as survey modules—for instance, work experience and relationship to supervisors.
12. Some indexes contain four, and others, as many as 39 answers.
13. This act requires all electronic and information technology that is created by the federal government to be accessible to people with disabilities. Compliance allows users with assistive technology, such as screen readers, to use the tool.
14. One participant noted that the dashboard was “proof of concept that with strategic initiatives and targeted interventions, a federal leader can affect positive change and realize significant measurable improvement from 1 year to the next.”
15. A colleague from the Department of Homeland Security “shed a tear when we learned of [the] tool, watched the video, used it, and saw how fast the analysis was performed.” A senior user from the Centers for Disease Control and Prevention (CDC) shared that “EVS ART is a great tool to convey more data in less time and in a more meaningful way.” And a senior colleague from the Office of the Secretary of the Department of Health and Human Services stated that “EVS ART will allow us more time to analyze the data and focus more time on strategic planning.”
16. These are not jumps in specific questions but changes to the average of index measures. Many of the specific questions within the index measures went up by 40–50 percentage points in just one year.
17. Note that the specific question has been removed for 2022 and exchanged for a multiple-choice question. The wording of the question has been changed as well to address these concerns.

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