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Administrative Systems as Data Infrastructures: Rethinking State Capacity Through Work Management

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ABSTRACT

This article examines how administrative systems for work management can be reconceptualized as data infrastructures within the state, contributing to the development of analytical capacity in public organizations. While digital transformation in the public sector has largely focused on service delivery and citizen-facing platforms, less attention has been given to internal administrative systems through which governments generate and structure organizational data. To address this gap, the study adopts a qualitative single-case design, analyzing the development of the Integrated System for Attendance and Activity Management (SIGFA) in the State Secretariat for Planning of Piauí (SEPLAN/PI), Brazil. The methodological approach combines document analysis, observation of organizational routines, and exploratory interviews with key actors involved in the system's design and...

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RESEARCH ARTICLE

Administrative Systems as Data Infrastructures: Rethinking State Capacity Through Work Management

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Abstract

This article examines how administrative systems for work management can be reconceptualized as data infrastructures within the state, contributing to the development of analytical capacity in public organizations. While digital transformation in the public sector has largely focused on service delivery and citizen-facing platforms, less attention has been given to internal administrative systems through which governments generate and structure organizational data. To address this gap, the study adopts a qualitative single-case design, analyzing the development of the Integrated System for Attendance and Activity Management (SIGFA) in the State Secretariat for Planning of Piauí (SEPLAN/PI), Brazil. The methodological approach combines document analysis, observation of organizational routines, and exploratory interviews with key actors involved in the system's design and implementation. The findings reveal structural limitations in traditional time-control systems, particularly their focus on presence-based monitoring and their limited capacity to generate structured data on institutional activities. In contrast, SIGFA illustrates how administrative systems can be reconfigured to integrate time registration, activity monitoring, and data visualization into coherent data flows, enhancing organizational visibility, coordination, and decision-making. The article advances three contributions: it conceptualizes administrative systems as institutional data infrastructures; proposes an analytical model based on data generation, integration, and utilization; and provides empirical evidence from a Global South context. It also highlights tensions between data-driven management and data-based control, contributing to debates on digital transformation, state capacity, and public value.

Keywords: *State capacity, Digital transformation, Data infrastructures, Data-driven governance, Public value*

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1 Introduction

The growing complexity of contemporary public governance has intensified demands on the organizational capacities of the state, particularly regarding coordination, the production of strategic information, and evidence-based decision-making. In contexts marked by fiscal constraints, rising social demands, and increasing pressures for transparency, the ability of public organizations to generate, structure, and use data has become a central dimension of state capacity (Andrews et al., 2017; Mazzucato & Kattel, 2020).

Digital transformation has been widely recognized as a key driver of these capabilities. However, most of the literature has focused on external-facing dimensions of digital government, such as service delivery, citizen interaction, and platform governance (Dunleavy et al., 2022; Margetts & Dunleavy, 2023). Less attention has been paid to the internal administrative systems through which governments organize work, coordinate activities, and produce operational data.

This omission is analytically significant. Recent scholarship on data infrastructures and datafication suggests that organizational realities are increasingly shaped by the systems that structure how data is generated, classified, and mobilized (Bowker & Star, 1999; Plantin et al., 2018; Kitchin, 2014). In this perspective, information systems are not merely technical tools but socio-technical infrastructures that embed classifications, shape organizational behavior, and influence decision-making processes. Despite this growing body of research, public administration studies have not sufficiently explored how routine administrative systems—particularly those related to work management—function as data infrastructures within the state.

In practice, this gap is reflected in the persistence of fragmented and low-informational administrative tools for managing work in public organizations. Traditional time-control systems are typically designed to verify attendance rather than to generate structured information about institutional activities, workflows, and outputs. As a result, they provide limited support for understanding how daily work relates to organizational priorities and policy outcomes.

This article addresses this gap by advancing the analytical proposition that administrative systems for work management can be understood as institutional data infrastructures. In contrast to conventional information systems—which are often designed for registration, compliance, or operational support—data infrastructures are defined here as integrated socio-technical arrangements that systematically produce, structure, and circulate organizational data, enabling monitoring, coordination, and learning processes within the state.

Building on this perspective, the article analyzes the design of the Integrated System for Attendance and Activity Management (SIGFA), developed at the State Secretariat for Planning of Piauí (SEPLAN/PI), Brazil. The case provides an empirical basis to examine how an internal administrative system can be intentionally designed to move beyond

attendance control and operate as a data-generating infrastructure for organizational analysis and decision-making.

This article makes three main contributions to the literature. First, it introduces a conceptual distinction between administrative information systems and administrative data infrastructures, clarifying how systems oriented toward data production differ from those focused on control or registration. Second, it proposes an analytical framework that integrates people management, digital systems, and data governance, showing how routine administrative processes can be transformed into structured data flows that support state analytical capacity. Third, it provides empirical insights from a subnational context in the Global South, contributing to the international debate on digital transformation by illustrating how internal administrative systems can shape data-driven governance beyond service delivery platforms.

Methodologically, the study adopts a qualitative single-case design with an analytical-prospective approach. It combines document analysis, observation of organizational routines, and exploratory interviews with key actors involved in the system's design and implementation. Although the system is still in the pilot phase, the analysis draws on empirical evidence regarding its development process and institutional design, complemented by theoretically informed inferences about its potential effects.

The findings suggest that reconfiguring administrative systems as data infrastructures may enhance organizational visibility, strengthen coordination, and support evidence-based decision-making. At the same time, this transformation introduces new tensions related to control, surveillance, and the governance of organizational data. By highlighting these dynamics, the article contributes to a more nuanced understanding of digital transformation in public administration, emphasizing that internal administrative systems are not merely operational tools but central components in the construction of state capacity.

2 Theoretical Framework

This study develops an analytical framework to examine how administrative systems for work management can operate as data infrastructures within the state. To do so, it integrates and extends three strands of literature: state capacity, digital transformation in the public sector, and datafication/data infrastructures.

Rather than treating these dimensions as parallel perspectives, the article articulates them into a unified analytical proposition: that the production, structuring, and use of organizational data within administrative routines constitutes a central mechanism through which state capacity is built and exercised.

2.1 State capacity and the role of organizational data

The literature on state capacity has traditionally emphasized the role of institutional arrangements, bureaucratic quality, and policy implementation capabilities (Andrews et al., 2017; Pires & Gomide, 2016). More recent contributions have expanded this perspective by highlighting the importance of analytical capacity, understood as the ability of public organizations to generate, interpret, and use information to guide decision-making (Mazzucato & Kattel, 2020).

Within this view, organizational data is not merely a byproduct of administrative activity but a strategic resource that enables coordination, learning, and policy monitoring. The capacity to systematically produce and mobilize such data becomes a key dimension of state effectiveness, particularly in complex governance environments.

However, despite this recognition, the literature has paid limited attention to the concrete mechanisms through which such data is generated within organizations. In particular, the role of internal administrative systems as infrastructures for data production remains underexplored.

2.2 Digital transformation beyond service delivery

Research on digital transformation in the public sector has predominantly focused on external-facing systems, such as digital services, platforms, and citizen interaction (Dunleavy et al., 2022; Margetts & Dunleavy, 2023). These studies emphasize integration, interoperability, and the use of data to improve service delivery and policy outcomes.

While this literature has advanced the understanding of digital government, it tends to overlook the internal administrative systems that structure everyday organizational processes. Yet, it is precisely within these systems that large volumes of operational data are generated, often in fragmented and underutilized forms.

This omission limits the analytical scope of digital transformation studies. If digital government is understood as the reconfiguration of how the state produces and uses information, then internal administrative systems—particularly those related to work management—must be considered central components of this transformation.

2.3 Data infrastructures and the process of datafication

To address this gap, this study draws on the literature on data infrastructures and datafication. Foundational works in this field argue that data is not simply collected but actively constructed through socio-technical systems that classify, standardize, and organize information (Bowker & Star, 1999; Kitchin, 2014; Edwards et al., 2009). From this perspective, infrastructures are not static technical backbones, but evolving relational systems that shape how data is produced, shared, and made meaningful across organizational contexts. Data infrastructures are thus understood as relational and institutional arrangements that enable the continuous production and circulation of data across organizational contexts (Plantin et al., 2018; Edwards et al., 2009), emphasizing their embeddedness in organizational routines and their role in structuring knowledge production.

From this perspective, information systems do more than support administrative processes; they shape what can be known, how it is measured, and how decisions are made. The process of datafication—the transformation of social and organizational practices into quantifiable data—reconfigures not only information flows but also power relations, as visibility, monitoring, and evaluation become increasingly mediated by data systems.

In public administration, this implies that the adoption of digital systems is not a neutral technical process but a transformation that affects how work is organized, how performance is interpreted, and how control is exercised. In particular, systems that generate granular data on activities and outputs may simultaneously enhance analytical capacity and intensify mechanisms of surveillance and standardization.

2.4 From administrative information systems to data infrastructures

Building on these insights, this study proposes a conceptual distinction between **administrative information systems** and **administrative data infrastructures**.

Administrative information systems are typically designed to:

- register events (e.g., attendance, transactions)
- ensure compliance with formal rules
- support routine administrative operations

In contrast, administrative data infrastructures are characterized by their capacity to:

- systematically generate structured data from routine activities
- integrate multiple dimensions of organizational processes
- enable the production of analytical indicators and visualizations
- support coordination, learning, and decision-making across units

This distinction shifts the analytical focus from systems as tools of registration to systems as infrastructures that shape organizational knowledge and action.

2.5 Analytical model: administrative systems as data infrastructures

Based on this conceptual differentiation, the study advances the following analytical proposition:

Administrative systems for work management can evolve into data infrastructures when they integrate time registration, activity monitoring, and data visualization into structured and interoperable data flows that support organizational analysis and decision-making.

This proposition can be analytically decomposed into three interrelated dimensions:

1. **Data generation** – the systematic recording of both time and activities as structured data inputs
2. **Data integration** – the linkage of different data sources into coherent and interoperable datasets
3. **Data utilization** – the transformation of data into indicators, dashboards, and analytical outputs that inform managerial action

Together, these dimensions define a process through which routine administrative practices are converted into organizational data infrastructures capable of enhancing state analytical capacity.

2.6 Tensions: data-driven management versus data-based control

While such systems may strengthen coordination and evidence-based decision-making, they also introduce important tensions. The same infrastructures that enable learning and analysis may be used to intensify monitoring and control over work.

This distinction between data-driven management and data-based control is analytically relevant. The former refers to the use of data to support organizational learning and improve decision-making, while the latter emphasizes the use of data as a mechanism for surveillance, standardization, and performance enforcement.

These dynamics are particularly salient in the field of people management, where the transition from presence-based control to activity-based monitoring may redefine professional autonomy and reshape internal power relations.

2.7 Public value, data governance, and institutional conditions

Finally, the literature on public value highlights that the effectiveness of administrative innovations depends on their alignment with broader societal objectives (OECD, 2020). In this sense, the transformation of administrative systems into data infrastructures is not inherently beneficial; its value depends on how data is governed, interpreted, and used.

Robust data governance arrangements—including clear rules on data access, transparency, and purpose limitation—are essential to ensure that such systems contribute to coordination and learning rather than reinforcing opaque or punitive forms of control.

2.8 Synthesis

By integrating these perspectives, this study positions administrative systems for work management as a critical but underexplored site of digital transformation. Rather than treating them as peripheral tools of bureaucratic control, it conceptualizes them as infrastructures through which the state produces knowledge about its own functioning.

In doing so, the framework provides a basis for analyzing how the design of such systems may shape not only administrative processes but also the development of state capacity, the configuration of organizational power, and the emergence of data-driven governance.

3 Methodology

This study adopts a qualitative research design, structured as an analytical-prospective single case study of a digital transformation initiative in the field of work management in the public sector. Qualitative approaches are particularly appropriate for examining complex, context-dependent organizational phenomena, as they enable an in-depth understanding of institutional practices, decision-making processes, and dynamics of change (Denzin & Lincoln, 2018; Flick, 2009).

3.1 Research design and case selection

The research strategy is based on a single case study, with the State Secretariat for Planning of Piauí (SEPLAN/PI), Brazil, as the unit of analysis. Case study research is widely used in public administration to investigate contemporary phenomena embedded in real-world contexts, particularly when the boundaries between the phenomenon and its institutional environment are not clearly defined (Yin, 2018).

The case was selected based on its analytical relevance rather than statistical representativeness. SEPLAN/PI plays a strategic role in governmental planning, policy monitoring, and budget coordination at the subnational level, making it a suitable setting for examining how internal administrative systems may contribute to state capacity. Additionally, the development of the Integrated System for Attendance and Activity Management (SIGFA) provides a unique opportunity to analyze the intentional design of an administrative system as a data infrastructure.

3.2 Empirical focus and analytical orientation

The empirical focus of the study is the design and early-stage implementation of SIGFA. Rather than evaluating consolidated outcomes, the study adopts an analytical-prospective orientation, examining how the system is conceived, structured, and expected to operate as a data infrastructure within the organization.

This approach allows the identification of causal mechanisms embedded in the system's design, even in the absence of long-term implementation data. In line with process-oriented qualitative research, the emphasis is placed on understanding how decisions are made, how organizational problems are framed, and how institutional solutions are constructed.

3.3 Data sources and collection

The analysis draws on multiple sources of qualitative evidence, enabling triangulation and enhancing the robustness of the findings. Four main sources of data were used:

(i) Document analysis: Institutional documents, including administrative regulations, normative instructions, internal reports, and technical materials related to attendance control and system development, were analyzed to reconstruct the formal structure of work management practices.

(ii) Direct observation of organizational routines: Observational data were collected through the monitoring of administrative processes

related to attendance management, activity reporting, and internal coordination. These observations provided insights into how work is effectively organized and recorded in practice.

(iii) Exploratory semi-structured interviews: To complement documentary and observational data, exploratory interviews were conducted with key actors involved in the design and implementation of the system, including managers, technical staff, and users from administrative units. The interviews focused on three dimensions: (a) perceived limitations of existing systems, (b) decision-making processes in the design of SIGFA, and (c) expectations and concerns regarding its implementation.

These interviews provided critical insights into how the system was conceptually framed and how organizational actors interpret its purposes. For example, one manager emphasized that *"the main problem was not controlling attendance, but understanding what people actually do during the workday"*, highlighting the shift from presence-based control to activity-based data generation.

(iv) Technical and design records: Materials produced during the system design process—including functional specifications, internal presentations, and workflow models—were analyzed to reconstruct the system's architecture and underlying assumptions.

3.4 Analytical strategy

The analysis was conducted through an iterative and interpretive process, combining inductive and deductive approaches.

First, empirical data were coded to identify recurrent patterns related to work management practices and system limitations. This process resulted in three analytical categories: (a) fragmentation of time-control instruments, (b) absence of structured activity data, and (c) limited availability of managerial information.

Second, these categories were interpreted in light of the theoretical framework developed in the previous section, particularly the concepts of data infrastructures and datafication. This step enabled the articulation between empirical observations and broader analytical propositions.

Third, the design of SIGFA was examined as an institutional response to the identified problems, allowing the identification of underlying mechanisms related to data generation, integration, and utilization.

3.5 Ensuring rigor and validity

To enhance methodological rigor, the study follows established criteria in qualitative research, including credibility, transferability, and dependability.

- **Credibility** was strengthened through data triangulation, combining documentary analysis, observation, interviews, and technical records.
- **Transferability** was addressed by providing a detail account of the institutional context and system design, enabling analytical generalization to similar settings.
- **Dependability** was ensured through transparent documentation of data sources, analytical procedures, and category construction.

Additionally, the use of multiple data sources allowed for the convergence of evidence, reducing the risk of biased interpretations.

3.6 Positionality and limitations

The study acknowledges the potential for insider bias, given the proximity of the researcher to the institutional context. Rather than treating this as a limitation to be eliminated, the study adopts a reflexive stance, recognizing that insider access also enables a deeper understanding of organizational processes that would be difficult to capture through external observation alone.

To mitigate potential biases, three strategies were employed: (i) triangulation of multiple data sources, (ii) inclusion of perspectives from different organizational actors through interviews, and (iii) explicit separation between empirical evidence and analytical inference.

Nonetheless, important limitations remain. The study focuses on a single case and relies on early-stage evidence, which limits the possibility of evaluating long-term effects. Furthermore, the absence of comparative cases constrains the generalizability of the findings. Accordingly, the results should be interpreted as analytically informative rather than statistically representative.

4 RESULTS

This section presents the findings in two analytically integrated parts: (i) empirical evidence derived from the organizational diagnosis conducted at SEPLAN/PI, and (ii) the analysis of SIGFA's institutional design as an emerging data infrastructure. While analytically distinct, these dimensions are closely connected, as the system's design directly responds to the limitations identified in existing work management practices.

4.1 Fragmented systems and the absence of organizational data

The organizational diagnosis reveals that traditional time-control systems in SEPLAN/PI are structured primarily around the registration of physical presence, with limited capacity to generate meaningful data about institutional activities.

Empirically, the system operates through a fragmented set of spreadsheets and manual records submitted by different administrative units. These records are not standardized, lack interoperability, and are primarily oriented toward compliance rather than analysis. As one administrative technician noted: *"Each unit sends its own spreadsheet, but there is no pattern. In the end, we know who showed up, but we don't know what was actually done."*

This fragmentation directly affects the data generation dimension identified in the analytical framework. While time is recorded, activities are not systematically captured, resulting in a dataset that is structurally incomplete and analytically limited.

A second critical limitation concerns activities performed outside the workplace. Fieldwork, interinstitutional meetings, and technical visits are often recorded informally or not recorded at all. As a manager explained: *"If someone spends the whole day in a technical meeting outside, the system may register it as absence. There is no way to show that work actually happened."*

This gap introduces ambiguity into the data, undermining its reliability and reducing its usefulness for managerial purposes. From a data infrastructure perspective, this reflects a failure not only of data generation but also of data classification, as relevant categories of work are not adequately represented.

A third limitation relates to the absence of integration across administrative tools. Data on attendance, activities, and outputs are stored in separate and non-communicating systems. This prevents the construction of coherent datasets that could support organizational analysis. As a result, the data integration dimension is largely absent.

Taken together, these findings indicate that existing systems function as administrative information systems oriented toward registration and compliance, rather than as data infrastructures capable of supporting coordination and decision-making.

4.2 Analytical implications: low visibility and constrained state capacity

The limitations identified have direct implications for organizational performance and state capacity.

First, the lack of structured activity data reduces organizational visibility. Managers are unable to systematically assess how work is distributed, which activities consume the most time, or how tasks relate to institutional priorities. Decision-making thus relies on fragmented information or informal knowledge.

Second, the absence of integrated data constrains coordination across units. Without shared information on activities and workloads, it becomes difficult to align processes, identify bottlenecks, or redistribute resources effectively.

Third, the system limits organizational learning. As data is not systematically produced or analyzed, opportunities to identify patterns, evaluate performance, and improve processes remain largely unexplored.

These findings reinforce the argument that the capacity to generate and use organizational data is a critical component of state capacity. In the absence of such data infrastructures, administrative systems remain confined to procedural control, with limited contribution to analytical governance.

4.3 SIGFA as an emerging administrative data infrastructure

The development of SIGFA can be interpreted as an institutional response to the limitations identified, aiming to transform fragmented administrative practices into an integrated data infrastructure.

Unlike existing systems, SIGFA is designed to operate simultaneously across the three analytical dimensions proposed in this study: data generation, data integration, and data utilization.

4.3.1 Data generation: from presence to activity-based recording. A central innovation of SIGFA lies in the expansion of data generation mechanisms. In addition to recording working time, the system requires the structured registration of institutional activities.

This shift reflects a deliberate move from presence-based control toward activity-based data production. As one system designer explained: *"The goal is not just to know if the person was there, but what was produced during that time."*

By linking time records to specific activities, the system enables the creation of datasets that reflect work processes rather than mere attendance. This enhances the granularity and relevance of organizational data.

4.3.2 Data integration: building coherent data flows. SIGFA also addresses the fragmentation of existing systems by integrating multiple dimensions of work management into a unified platform.

Attendance data, activity records, and organizational information are structured within a single system, enabling the construction of interoperable datasets. This integration allows for the analysis of relationships between time allocation, task execution, and organizational outputs.

From an analytical perspective, this represents a transition from isolated data points to structured data flows, which are essential for the functioning of data infrastructures.

4.3.3 Data utilization: dashboards and managerial analytics. A third key dimension of the system is its capacity for data utilization. SIGFA incorporates visualization tools, such as dashboards, that translate raw data into analytical outputs.

These tools enable managers to monitor indicators related to workload distribution, activity patterns, and organizational performance. As noted by a senior manager: *"For the first time, we will be able to see where time is actually being spent and how activities are distributed across teams."*

This capacity transforms administrative data into actionable information, supporting evidence-based decision-making and enhancing organizational coordination.

4.4 Organizational implications and emerging tensions

While SIGFA expands analytical capacity, it also introduces new organizational dynamics.

On the one hand, increased data availability enhances transparency and supports more informed decision-making. On the other hand, it raises concerns about monitoring and control. As one interviewee observed: *"It can help a lot with management, but people are also worried about how this information might be used."*

This reflects the tension identified in the theoretical framework between data-driven management and data-based control. The same system that enables learning and coordination may also be perceived as a mechanism of surveillance.

These findings suggest that the transformation of administrative systems into data infrastructures is not purely technical but deeply institutional, involving changes in organizational culture, power relations, and governance practices.

4.5 Synthesis of findings

The empirical analysis demonstrates that the transition from traditional administrative systems to data infrastructures involves three interrelated transformations:

1. From fragmented records to structured data generation
2. From isolated systems to integrated data flows
3. From administrative registration to analytical utilization

These transformations illustrate how internal administrative systems can evolve into infrastructures that shape organizational knowledge and action. At the same time, they highlight that such evolution is contingent upon institutional design choices and governance arrangements.

5 Discussion

This section interprets the findings in light of the analytical framework developed in this study, focusing on how the case of SIGFA contributes to a broader understanding of administrative systems as data infrastructures. Rather than reiterating empirical results, the discussion situates the case within ongoing debates on state capacity, digital transformation, and datafication in the public sector.

5.1 From administrative systems to data infrastructures

The findings suggest that the transformation observed in SIGFA is not merely technological but conceptual. The system illustrates a shift from administrative information systems—primarily oriented toward registration and compliance—to administrative data infrastructures capable of generating, integrating, and mobilizing organizational data.

This transformation can be analytically understood through the three dimensions proposed in this study.

First, at the level of data generation, the transition from presence-based recording to activity-based registration expands what is made visible within the organization. In line with the literature on datafication (Kitchin, 2014; Beer, 2019), this shift does not simply increase the volume of data but redefines what counts as work, as activities become formally classified, quantified, and rendered visible through data systems.

Second, the data integration enabled by SIGFA addresses the fragmentation identified in traditional systems. By linking time, activities,

and organizational information within a unified structure, the system creates relational datasets that allow for more complex forms of analysis. This aligns with studies on data infrastructures, which emphasize the importance of interoperability and standardization in enabling data circulation and reuse (Plantin et al., 2018).

Third, the dimension of data utilization is operationalized through dashboards and analytical tools that translate raw data into actionable information. This reinforces the role of administrative systems not only as repositories of information but as mechanisms that shape decision-making processes and organizational learning.

Taken together, these dimensions support the central proposition of this article: that administrative systems for work management can evolve into infrastructures that actively produce organizational knowledge, thereby contributing to the development of state analytical capacity.

5.2 Implications for state capacity and digital transformation

By conceptualizing administrative systems as data infrastructures, this study contributes to a shift in how digital transformation is understood in public administration.

Rather than focusing exclusively on service delivery and citizen-facing platforms, the findings highlight the importance of internal administrative systems as foundational components of digital government. This perspective extends existing literature by showing that state capacity is not only enhanced through external digitalization, but also through the internal reconfiguration of how data is produced and used within organizations.

In this sense, the case of SIGFA illustrates that analytical capacity is not an abstract attribute, but an emergent property of socio-technical systems embedded in everyday administrative routines. The ability to monitor, coordinate, and learn depends on the existence of infrastructures that systematically generate and organize data about institutional functioning.

Moreover, the findings suggest that digital transformation in the public sector involves a reconfiguration of organizational knowledge itself. By structuring how activities are recorded and analyzed, administrative data infrastructures shape not only decision-making processes but also how organizations interpret their own performance and priorities.

5.3 Organizational dynamics: coordination, learning, and cultural change

The implementation of SIGFA also reveals important organizational implications that extend beyond its technical design.

First, the system enhances coordination by reducing informational asymmetries across units. The availability of shared and structured data enables more consistent alignment between organizational processes, supporting horizontal integration and more coherent decision-making.

Second, the system creates conditions for organizational learning. The continuous production of data allows managers to identify patterns, evaluate processes, and adjust practices over time. This reinforces the idea that data infrastructures are not static systems, but evolving environments that support iterative learning.

Third, the findings point to processes of cultural change. By shifting the focus from presence to activities and outputs, the system challenges established norms of control and accountability in public administration. However, this transition is contingent upon how the system is interpreted and used.

Importantly, the evidence suggests that increased visibility may be perceived ambivalently by organizational actors. While it enables more informed management, it may also generate concerns about surveillance and loss of autonomy. This reinforces the argument that technological change is inseparable from institutional and cultural dynamics.

5.4 Replicability and institutional conditions

Although the case of SIGFA is context-specific, it provides insights into the conditions under which administrative systems may function as data infrastructures in other public sector settings.

Three conditions appear particularly relevant.

First, digital infrastructure is a necessary but insufficient condition. Beyond technical capacity, systems must be designed to capture meaningful data about organizational processes.

Second, data governance arrangements are critical to ensure data quality, integrity, and appropriate use. Without clear rules and standards, the expansion of data generation may lead to fragmentation or misuse, undermining the system's effectiveness.

Third, the integration between people management and strategic management emerges as a key enabling factor. The value of workforce-related data depends on its connection to broader organizational objectives, rather than its isolation within administrative routines.

These conditions suggest that replicability is not a matter of technological transfer, but of institutional alignment. The effectiveness of such systems depends on how they are embedded within broader governance structures and organizational practices.

5.5 Tensions, risks, and the governance of data

A central contribution of this study lies in highlighting the tensions inherent in the transformation of administrative systems into data infrastructures. While such systems enhance analytical capacity, they also expand the scope of monitoring and control. As highlighted in the literature on data and power, data infrastructures are not neutral, but actively shape visibility, evaluation, and organizational behavior (Beer, 2019). This creates a risk of what can be described as functional drift, in which data initially intended for learning and coordination is repurposed for evaluation and sanctioning.

This dynamic reflects the broader tension between data-driven management and data-based control, in which the same data systems that enable learning and coordination may also function as instruments of standardization, surveillance, and performance enforcement (Beer, 2019). The distinction is not merely conceptual but depends on how data is governed, interpreted, and used within organizations.

From a technical perspective, challenges related to interoperability, data quality, and information security may compromise the reliability of the system. From an organizational perspective, perceptions of surveillance may undermine trust and generate resistance. From an ethical perspective, the use of data for punitive purposes may distort the original objectives of the system.

In this context, institutional safeguards play a critical role in mitigating the risks associated with functional drift. The Brazilian General Data Protection Law (LGPD) establishes key principles—such as purpose limitation, necessity, transparency, and accountability—that are directly relevant to the governance of administrative data. In particular, the principle of purpose limitation constrains the use of data to explicitly defined objectives, reducing the likelihood that data collected for managerial coordination will be repurposed for disciplinary or punitive ends without proper justification.

Similarly, requirements related to transparency and data subject rights contribute to strengthening trust and legitimacy, while accountability mechanisms reinforce the need for clear governance structures regarding data access, interpretation, and use. When effectively implemented, these safeguards can help align data infrastructures with public value, preventing their drift toward opaque or coercive forms of control.

These risks underscore the importance of robust data governance frameworks that define the purposes, limits, and acceptable uses of organizational data. Ensuring transparency, accountability, and

proportionality in data use is essential not only to sustain the legitimacy of such systems, but also to preserve their capacity to function as instruments of coordination, learning, and evidence-based decision-making.

5.6 Synthesis: rethinking administrative systems in the digital state

The case analyzed in this study suggests that administrative systems occupy a central but underexamined position in contemporary processes of state transformation.

By functioning as infrastructures for data production and use, these systems shape how organizations generate knowledge about themselves, coordinate their activities, and make decisions. In this sense, they are not peripheral tools of bureaucratic control, but core components of digital governance.

Reframing administrative systems as data infrastructures thus provides a new analytical lens for understanding the relationship between digital transformation and state capacity. It shifts attention from technological adoption to the socio-technical processes through which data is produced, structured, and mobilized within public organizations.

6 Conclusion

The increasing complexity of contemporary public governance has intensified the need for administrative systems capable of supporting coordination, transparency, and evidence-based decision-making. Within this context, digital transformation should be understood not merely as a technological shift, but as a structural reconfiguration of how public organizations generate, structure, and use information.

This study examined the design of an integrated system for attendance and activity management (SIGFA) in the State Secretariat for Planning of Piauí (SEPLAN/PI), adopting a qualitative and analytical-prospective case study approach. The findings demonstrate that traditional time-control systems remain predominantly oriented toward the registration of formal presence, offering limited capacity to generate structured and meaningful data about institutional activities and organizational performance. As a result, they contribute only marginally to analytical capacity and organizational coordination.

In contrast, the design of SIGFA illustrates how administrative systems can be reconfigured to operate as integrated data infrastructures. By combining time registration, activity monitoring, and data visualization, the system enables the production of structured data flows that enhance organizational visibility and support more informed decision-making processes.

Building on these findings, this article advances three main contributions.

First, it conceptualizes administrative systems for work management as institutional data infrastructures, distinguishing them from conventional information systems focused on registration and compliance. Second, it proposes an analytical model based on three interrelated dimensions—data generation, data integration, and data utilization—through which routine administrative practices can be transformed into structured sources of organizational knowledge. Third, it provides empirical evidence from a subnational context in the Global South, demonstrating how internal administrative systems can play a central role in shaping data-driven governance beyond service delivery platforms.

Beyond these contributions, the study highlights a fundamental tension in the digital transformation of public administration. While data infrastructures expand the capacity for coordination, monitoring, and learning, they simultaneously extend the scope of visibility and control over work, reinforcing the role of data as a mechanism through which organizational behavior is shaped and governed (Beer, 2019). The distinction between data-driven management and data-based **control** thus emerges as a key analytical lens for understanding how data is mobilized within public organizations.

From a practical perspective, the findings suggest that the effectiveness of such systems depends on specific institutional conditions. Digital infrastructure, data governance arrangements, and the integration between people management and strategic management are critical enabling factors. Equally important are change management strategies that ensure user engagement, transparency in data use, and alignment with organizational culture.

At the same time, the study underscores that the transformation of administrative systems into data infrastructures is not inherently beneficial. Its outcomes depend on how data is governed, interpreted, and used. Without clear institutional safeguards, such systems may reinforce surveillance dynamics, undermine trust, and limit their potential contribution to public value.

This study presents important limitations. The analysis is based on a single case and relies on early-stage evidence, which constrains the assessment of long-term effects. In addition, the proximity of the researcher to the institutional context introduces potential bias, although this was mitigated through data triangulation and the inclusion of multiple perspectives. Accordingly, the findings should be interpreted as analytically informative rather than statistically generalizable.

Future research should advance empirical investigations into the implementation and effects of administrative data infrastructures, particularly through comparative and longitudinal designs. Further studies could examine how such systems are appropriated by organizational actors, how they evolve over time, and how tensions between analytical capacity and control are negotiated in different institutional contexts.

Ultimately, this article argues that internal administrative systems are not peripheral tools of bureaucratic control, but central components in the construction of state capacity. By shaping how data is produced, structured, and mobilized, these systems influence not only how public organizations operate, but also how they understand and govern themselves. In this sense, placing public servants at the center of digital transformation is not simply a managerial strategy, but a necessary condition for building data infrastructures that balance innovation, institutional capacity, and public value.

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