

Strategic Use of Data in Digital Transformation in Education

Introduction

The digital transformation of education systems has significantly increased the volume, variety, and speed of data generated about students, teachers, institutions, and public education policies. Education management information systems, learning assessments, administrative records, and new digital platforms now produce **growing amounts of information that could improve planning, management, and decision-making**. Yet data availability alone does not guarantee strategic use or improvements in educational quality and equity.

This gap between **data availability and use** is a key challenge that the present call for research proposals seeks to prioritize. The Learning Data Compact, launched in 2021 by UNESCO, UNICEF, and the World Bank, identifies a persistent “learning data crisis”: in many countries, data is not produced frequently enough, its quality is not always adequate, and even when it is available, it is not used effectively to inform decisions. The challenge, therefore, is not simply to produce more information, but to develop systems and capabilities that turn data into actionable evidence (UNESCO, UNICEF, & World Bank, 2021).

Against this backdrop, we need to move beyond viewing data as isolated outputs and adopt an educational data ecosystem approach, in which different sources, systems, stakeholders, sectors, and levels of government work together to generate relevant, timely, actionable information. This approach is particularly important in Latin America and the Caribbean, where Education Management Information Systems (EMIS) vary considerably in their development, integration, and responsiveness.

The Inter-American Development Bank's regional study of EMIS shows that these systems provide strategic infrastructure for the digital transformation of education management. EMIS encompass not only technology platforms but also management processes, institutional frameworks, regulations, capabilities, and mechanisms for recording, processing, analyzing, and disseminating strategic information. The study also identifies significant opportunities to improve the integration and use of information systems across the region (Arias Ortiz et al., 2021).

The need to strengthen these capabilities became especially clear during the COVID-19 pandemic. The suspension of in-person instruction and the need to maintain educational continuity increased demand for information in terms of volume, frequency, and scope. Education information systems had to meet new needs—including identifying students who had disengaged from education, monitoring continuity in their educational pathways, and planning the return to in-person instruction—while maintaining their traditional functions. This experience demonstrated both the strategic value of timely information and the limitations of systems unable to respond quickly and flexibly enough to changing circumstances (IIPe-UNESCO, 2022).

Integrating information sources remains a central challenge. Latin America and the Caribbean have examples of EMIS being linked with other systems and data sources, but questions remain about the technical, institutional, and regulatory conditions needed to achieve interoperability. A regional study by IIPe-UNESCO, drawing on the experiences and reflections of specialists from 14 countries, highlights the importance of examining how EMIS can be integrated with other information sources and exploring the prospects and challenges involved (IIPe-UNESCO, 2021).

Nevertheless, **interoperable systems** and higher-quality data are not sufficient on their own. International evidence on evidence-informed decision-making shows that data use is a complex process involving capabilities, leadership, collaboration, interpretation, and organizational

conditions. Schildkamp (2019) notes that research on data use in education has tended to focus on assessment results, even though combining different sources of evidence offers greater potential for addressing a range of educational improvement challenges. The task, then, is not simply to use data, but to establish processes through which different stakeholders can formulate relevant questions, select and interpret evidence, make decisions, and subsequently evaluate the outcomes.

Building an **institutional culture of data use** is therefore a central dimension of Digital Transformation in Education. Research by Schildkamp, Poortman, Ebbeler, and Pieters (2019) shows that sustainable data-use practices require, among other things, a shared vision and goals, support for stakeholders, intellectual stimulation, an institutional climate conducive to data use, and mechanisms for coordination across organizational units. Strategic data use is thus as much about capabilities and leadership as it is about technological infrastructure.

Data quality is another particularly important dimension. UNICEF's Data Quality Framework (2021) takes a comprehensive view of quality and emphasizes that improving it requires organizational processes that support the production, management, and use of reliable information. Specifically, the framework seeks to promote a coherent approach to data quality across sectors and its appropriate use by decision-makers.

The educational data agenda also offers an opportunity to strengthen equity strategies. In a region marked by profound social and educational inequalities, data availability, quality, and disaggregation affect education systems' ability to identify who is being excluded and design appropriate responses. The 2020 GEM Report for Latin America and the Caribbean, prepared by UNESCO together with OREALC/UNESCO Santiago and SUMMA, highlights persistent structural inequalities and documents multiple forms of exclusion associated with socioeconomic status, rural location, disability, ethnic origin, and migration status.

From this perspective, strengthening educational data ecosystems also means asking who is represented in the data, what information is collected about particular groups, which data remains fragmented or invisible, and who can effectively access, interpret, and use that information. The data agenda must contribute not only to more efficient management but also to making inequalities visible, revealing intersecting forms of disadvantage, and guiding policies capable of addressing them.

Multisectoral coordination is a complementary aspect of this challenge. Educational pathways are shaped by social, economic, geographic, health-related, and cultural factors. **Linking education data with other sources** can therefore support more comprehensive assessments and the design of cross-sector responses. This raises new challenges concerning governance, data protection, interoperability, the allocation of responsibilities, and institutional capabilities.

Finally, the rapid expansion of artificial intelligence (AI) and advanced analytics tools creates new opportunities for processing and using educational data, while also introducing risks and dilemmas. UNESCO's guidance on AI and education states that policies should seek to harness the opportunities offered by AI while mitigating unintended effects, with particular attention to inclusion, equity, capabilities, and governance (Miao et al., 2021). **Integrating AI into educational data management** could support early risk identification, pattern detection, information integration and classification, process automation, and the generation of inputs for decision-making. However, these applications require rigorous evidence of their effectiveness and impact, alongside mechanisms to address privacy, bias, transparency, explainability, and accountability.

The Recommendation on the Ethics of Artificial Intelligence, adopted by UNESCO in November 2021, establishes a global framework intended to ensure that AI development and use are guided by human rights, transparency, equity, human oversight, and responsibility. It also recognizes

the importance of data governance and multistakeholder participation in developing and using these technologies.

In this context, the challenge for Latin America and the Caribbean is not simply to introduce new technologies into education systems, but to generate evidence about the conditions under which data can be used strategically to improve education policies, management, and outcomes. This requires simultaneous progress in data infrastructure and architecture, institutional capabilities for data use, equity and governance conditions that determine who can benefit from data, and the responsible development of new AI tools.

Maturity of Education Systems in the Region in Generating and Using Data

The diagnostic study Digital Transformation in Education in Latin America and the Caribbean: Where Are We and Where Are We Going? (Fundación Ceibal, 2026) gathers perspectives from five stakeholder groups—three governmental and two nongovernmental: 1. education system leaders (e.g., ministers and deputy ministers of education); 2. technology leaders (e.g., directors of educational innovation); 3. pedagogical leaders (e.g., directors of curriculum or teacher training); 4. third-sector representatives (academia and civil society organizations); and 5. school stakeholders (school administrators and teachers). The questionnaire, which informed an initial report in April 2026, includes open- and closed-ended questions covering nine thematic pillars: 1. Education system context; 2. Problem identification; 3. Definition of success; 4. Devices; 5. Connectivity; 6. Platforms; 7. Programs; 8. Teacher training; and 9. Data.¹

The “Data” pillar assesses the maturity of education systems in Latin America and the Caribbean in using evidence to plan, monitor, and continuously improve Digital Transformation in Education. It examines their ability to generate, use, and govern data relevant to decision-making, with particular

¹ At the time of writing, 200 responses had been received from 27 countries in the region.

emphasis on equity, data culture, and AI use. Along with “Teacher Training,” it received the lowest score in the regional diagnostic study: 5.23.²

Findings under this pillar show that the region’s main challenges lie not in the absence of information systems—which exist in most countries—but in the lack of an institutional culture capable of turning them into actionable information, fragmentation and limited interoperability between systems, and a pronounced imbalance in data access between governmental and nongovernmental stakeholders. The diagnostic study reveals a striking discrepancy: systems exist, but they are not used. Countries have enrollment platforms, observatories, and dashboards, yet their analytical practices are largely confined to statistical reporting rather than concrete action. As a teacher from El Salvador puts it: “Data is collected but not analyzed.” The issue, then, is not to build more data infrastructure, but to generate evidence on how existing data can inform decisions.

Moreover, Artificial Intelligence is the least developed dimension in the entire study (4.00), revealing an almost complete absence of strategies, governance, and evidence concerning its responsible use in education management. This call therefore seeks to generate empirical evidence in these critical areas, complementing the diagnostic findings with applied research that informs concrete policies.

Table 1. Scores by Dimension Under the *Data* Pillar

Dimension	Definition	Average	Maturity level ³
Information systems	Extent to which the education system has reliable information systems for collecting, integrating, and accessing educational data.	6.13	Consolidating

² The diagnostic study results, originally calculated on a methodological scale of 1 to 4, have been normalized to an equivalent scale of 1 to 10.

³ Maturity levels: Emerging: 1.00 to below 2.50; Initial: 2.50 to below 4.00; Developing: 4.00 to below 5.50; Consolidating: 5.50 to below 7.00; Consolidated: 7.00 to below 8.50; Advanced: 8.50 to 10.00.

Institutional capacity	Availability of technical and institutional capabilities to manage, analyze, and protect data, including ethical and cybersecurity considerations.	5.50	Consolidating
Culture of data use	Extent to which decision-making and the monitoring and improvement of education policies and programs are informed by systematic data use.	5.53	Consolidating
Equity in data use	Extent to which available data makes it possible to characterize vulnerable contexts, address their needs, and monitor the impact of digital transformation.	5.02	Developing
Artificial intelligence	Availability of measures to ensure transparency, ethics, and bias mitigation in the use of AI in education.	4.00	Developing

Based on the information gathered under the “Data” pillar, Fundación Ceibal’s diagnostic study identifies the following critical challenges:

- Fragmentation and interoperability: enrollment, scholarship, and infrastructure systems that do not communicate with one another.

As a representative of academia in Peru explains: *“We have one system for enrollment, another for scholarships, and another for infrastructure. They are not connected.”*

- Weak institutional structures: a lack of technical teams dedicated to data analysis and insufficient training for school management teams.

A representative of a civil society organization in Brazil observes:

“Disseminating training and professional development initiatives for education network management teams and school communities remains a critical challenge to promoting more effective and secure data analysis.”

- Inequality in access and governance: nongovernmental stakeholders report being unable to access government-collected data, while data production remains centralized for administrative rather than pedagogical purposes.

Regarding unequal data access, a representative of academia in Mexico states: *“There is no access to the system’s data. There is a complete lack of transparency, and data is not shared for research or improvement.”*

- AI as a largely unexplored area: weak strategies and governance, together with limited understanding of the role AI could play in education management. High-value potential applications—such as predicting school dropout—have been identified, but the capabilities needed to develop them are lacking.

On this point, a representative of a civil society organization in Bolivia comments in the open-ended responses under the “Data” pillar: “Nobody talks about AI in education management. It is not yet an issue in our country.” A school administrator from Chile adds:

“It would be useful to use AI to predict school dropout or identify at-risk students, but we lack the necessary capabilities.”

Knowledge Gaps and the Need for New Evidence

Despite progress in recent years, major knowledge gaps remain regarding the conditions that enable educational data to become a strategic resource for decision-making. Existing literature has helped identify challenges involving data quality, system integration, institutional capabilities, and governance. However, there is still limited empirical evidence on how these challenges play out in specific Latin American and Caribbean contexts and which strategies are effective in addressing them.

In particular, research needs to move beyond general assessments of information system development toward projects that identify the mechanisms, practices, and conditions that enable effective data use. Existing knowledge shows that information systems, digital platforms, or large

volumes of data do not automatically lead to better decisions. Yet we still need a clearer understanding of the capabilities, institutional arrangements, governance models, and working practices that allow data to be meaningfully incorporated into the planning, management, implementation, and evaluation of education policies.

This gap is especially significant in Latin America and the Caribbean. Although regional studies have examined Education Management Information Systems and their levels of development, interoperability, and digital transformation, more context-specific evidence is needed on how education systems use data once it has been produced and made available. In particular, we need to understand which factors explain differences among institutions, territories, and countries in their ability to turn information into decisions and concrete actions.

A first research area concerns interoperability and the development of data ecosystems. This challenge opens up an agenda for multisectoral data coordination. Integrating education, social, health, geographic, and labor market information could provide a more comprehensive understanding of educational pathways and the factors that shape them. Such integration raises questions about data protection, privacy, and institutional responsibilities. Multiple information systems can lead to fragmentation, duplicate records, and difficulties linking information produced by different institutions. Yet evidence remains limited on which technical, institutional, and governance models can support interoperable ecosystems in the region's specific contexts. Research is needed on data architectures, exchange protocols, governance mechanisms, and regulatory frameworks, among other issues, as well as the costs and benefits of different integration strategies.

A second knowledge gap concerns the institutional culture of data use. The following statements from Fundación Ceibal's diagnostic study (2026) illustrate the issue:

“Data is collected but not analyzed. Reports are presented, but nobody uses them to make decisions.” — School stakeholder (teacher), El Salvador

“There is no real culture of evaluation. Numbers are entered, but there is no institutional reflection.”

— Civil society organization representative, Colombia

International literature highlights the importance of leadership, capabilities, collaboration, and organizational conditions for effective data use (Schildkamp, 2019; Schildkamp et al., 2019). However, systematic evidence on these dimensions is less extensive in Latin American and Caribbean education systems. Research is needed to identify barriers to and enablers of data use and to evaluate interventions designed to strengthen the capabilities of technical teams, school leaders, and other decision-makers.

A third gap concerns equity in data availability and use. Generating evidence on potential collaboration between governmental and nongovernmental stakeholders (academia and organized civil society) is particularly important, as is examining multistakeholder coordination models that are institutionally sustainable and consistent with rights-based principles and the protection of individuals.

Finally, the growing adoption of artificial intelligence is creating a particularly dynamic research area. Although this technology can expand education systems’ data processing and analytical capabilities, evidence of its concrete impact on education management remains limited, especially in Latin America and the Caribbean. This includes both the effectiveness of applications and possible unintended effects involving bias, errors, lack of transparency, privacy problems, or dependence on models developed in different contexts.

In this area, it is particularly important to move from a research agenda centered on AI’s theoretical possibilities to one grounded in evidence of

impact. Studies are needed to assess the conditions under which AI applications produce real improvements in the use of data for education management, the institutional capabilities required for their appropriate adoption, and the oversight, evaluation, and governance mechanisms needed to ensure responsible use.

Taken together, these gaps point to the need for a research agenda that moves beyond asking “What data do education systems have?” to more complex questions: How can data be integrated? Who can access and use it? What institutional capabilities are needed? How can we ensure that new AI tools help turn data into decisions?

Potential Research Areas for This Call

Drawing on international research, Fundación Ceibal’s diagnostic study, and the identified knowledge gaps, the call for research proposals Strategic Use of Data in Digital Transformation in Education is organized around four complementary research areas:

1. Interoperability and Educational Data Ecosystems

Research evaluating models for integrating fragmented education information systems (enrollment, performance, infrastructure, socioeconomic context) and generating evidence on which data architectures are viable and sustainable in settings with limited technical capacity. This area also includes projects focused on integrating multisectoral information systems and sources, standards, interoperability, and governance models that can establish ecosystems capable of producing actionable information to help safeguard rights.

2. Institutional Culture of Data Use in Decision-Making

Studies documenting and evaluating existing national or subnational initiatives or pilot projects in which data analysis has informed pedagogical or management decisions, to understand which institutional conditions enable

the shift from “collecting” to “using” data. This area includes generating evidence on training and support models for management teams at the national, subnational, and school levels to strengthen data analysis. It also includes projects focused on developing capabilities, organizational practices, collaboration mechanisms, and institutional conditions that help turn data into evidence for planning, implementing, monitoring, and evaluating education policies and programs.

3. Equitable Access to Data and Multistakeholder Coordination

Research addressing the identified gap in data access between governmental and nongovernmental stakeholders. This includes data governance and open-data models that could provide academia and organized civil society with more equitable access without compromising data protection, while strengthening the use of evidence for pedagogical purposes. The underlying premise is that partnerships between governmental and nongovernmental stakeholders can make better use of data, support capability development, and generate context-specific knowledge.

4. Artificial Intelligence in Educational Data Management

Because AI received the lowest score both within the Data pillar and across the diagnostic study of Digital Transformation in Education in Latin America and the Caribbean, this research area seeks to generate empirical evidence on concrete AI applications grounded in data generation and analysis—for example, the early identification of at-risk students—assessing both their effectiveness and the governance conditions required for ethical use. It also covers projects focused on AI applications for managing, integrating, processing, and using educational data.

The four areas should be understood as interconnected dimensions of a single challenge: building education systems capable of turning high-quality data into useful knowledge to improve decisions, reduce inequalities, and strengthen Digital Transformation in Education. Priority will be given to

projects that go beyond describing problems to identify mechanisms, strategies, models, and practices that education systems across the region can adopt, providing scalable knowledge for the design, implementation, and evaluation of digital transformation policies in education.

The selected projects are therefore expected to help shift the focus from digitization and information availability toward strategic data use, understood as education systems' ability to produce, integrate, interpret, and use information in a timely, equitable, and responsible manner to improve decisions and outcomes.

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