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INTERNATIONAL APPROACHES TO THE DEVELOPMENT OF EDUCATION STATISTICS: INSTITUTIONAL FRAMEWORKS AND CURRENT PRACTICES*

Abstract. *The increasing role of data in education governance emphasises the importance of the development of education statistics as a key instrument for the information support of education policy. The study aims to generalise international experience in the field of education statistics and to analyse its functioning in the contemporary context as a multi-level institutional system of education data governance. The article analyses the organisational structure of the international system of education statistics, distinguishing global, regional (in particular the EU), and national levels, identifies the roles of key actors, including the UNESCO Institute for Statistics, the Organisation for Economic Co-operation and Development, and Eurostat, and pays particular attention to coordination mechanisms, primarily the joint UOE (UNESCO–OECD–Eurostat) data collection, which ensures the comparability and consistency of statistical information across countries. The significance of the Eurydice analytical and information network in the formation of comparative and up-to-date information on European education systems is also examined. It is shown that Education Management Information Systems (EMIS) act as key integrative components of national education data systems, ensuring the linkage between processes of data collection, harmonisation, and analytical use. A comparative analysis of selected countries demonstrates the diversity of EMIS architecture and data governance models, reflecting differences in national approaches to the organisation of education data. The main trends in the development of education statistics are identified, including digitalisation, the integration of different data sources, and the increasing role of analytical tools. At the same time, key challenges related to interoperability, analytical capacity, and the effective use of data in decision-making processes are outlined. Promising directions for further research include approaches related to the transition towards integrated cross-sectoral data ecosystems, in particular through the integration of education data with the fields of health, the labour market, and social*

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policy, which creates opportunities for a comprehensive analysis of human capital development.

Keywords: *education statistics, education data, education management information system (EMIS), data governance, international system of education statistics, evidence-based policy-making.*

JEL classification: I21, I28, O52.

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Introduction. The 21st century is characterised by processes of globalisation, digitalisation, and datafication, which are transforming socio-economic systems and creating new challenges in managing large-scale datasets [1]. Accordingly, the importance of information and systematic analysis continues to grow, particularly within data-driven governance [2].

Under these conditions, statistics has become a key instrument of public governance. Statistical data underpin evidence-based policy and informed decision-making, while data-driven approaches increasingly shape governance and enable systematic analysis and forecasting at national and international levels. At the same time, public attitudes towards data use depend on trust in institutions, privacy concerns, and how such data are framed [3].

In this regard, the international statistical system plays a central role in ensuring the availability of harmonised and comparable data for analytical purposes. The growing complexity of contemporary economic and social environments, coupled with an increasing emphasis on evidence-informed policy approaches, necessitates high-quality and timely data across countries [4], supported by coordinated international frameworks

Among the priority areas in the development of the international statistical system, education statistics play a key role, as they provide an evidence base for education policy and underpin human capital development. Accordingly, education is recognised as an important factor influencing technological development and economic performance [5], which, in turn, necessitates higher standards in terms of the quality, completeness, and comparability of statistical data in this field.

The growing importance of education statistics is further reinforced by the transition towards a knowledge-based economy, in which education and skills act as key determinants of long-term development trajectories. This increases the demand for robust and internationally comparable data to assess educational outcomes and identify priorities for effective education policy.

In this context, the United Nations Sustainable Development Goals (SDGs), in particular Goal 4 (Quality Education), emphasise the need for systematic monitoring of access to education, learning quality, and outcomes. This positions education statistics as a key instrument for assessing countries' progress and supporting evidence-based governance in the education sector, highlighting the importance of international education statistics in ensuring the comparability of indicators and monitoring progress towards SDG 4 [6].

Literature review. Education statistics have attracted considerable scholarly attention and are increasingly

examined from a multidisciplinary perspective, reflecting their growing relevance to data-driven governance, the harmonisation of methodological approaches, and education management information systems (EMIS). Given the central role of education as a key component of human capital, statistical data in this field are essential for analysing educational processes and informing policy decisions.

Recent studies conceptualise the transformation of governance systems as closely linked to processes of datafication and the growing centrality of data in policy processes and institutional practices. In particular, Williamson and Piattoeva [7] argue that the expansion of digital infrastructures and data practices is reshaping education governance, leading to a growing reliance on data-driven approaches in policy development, decision-making, and the organisation of education systems.

Institutional approaches emphasise that education systems and policies are embedded in broader organisational environments. Anderson and Colyvas [8] emphasise that the persistence and transformation of educational practices are driven by institutional mechanisms that govern the production, legitimisation, and reproduction of knowledge.

At the international level, statistical systems may be understood as institutionalised frameworks for the production of harmonised and comparable data, grounded in shared methodological standards and classifications, such as the International Standard Classification of Education (ISCED). These systems are shaped by the interaction of international organisations that contribute to the development of statistical standards, data infrastructures, and policy-relevant indicators. In particular, the UNESCO Institute for Statistics (UIS), the OECD, and the World Bank are widely recognised as key actors in the development of global education statistics and comparative data systems [9]. At the same time, comparative analyses reveal differences in their ideological and policy orientations, which are reflected in their approaches to data, indicators, and education governance [10].

In the Ukrainian context, a substantial body of research has focused on the study of international best practices and the alignment of national education statistics with European approaches, particularly in the context of improving public policy and education governance systems. For instance, Voznyuk [11] emphasis that the effectiveness of education management depends on the alignment between policy frameworks, institutional arrangements, and the use of analytical information, while Husak et al. [12] highlight the importance of aligning national education policies with European standards and the role of international information and analytical networks, such as Eurydice, in supporting policy development and ensuring comparability of education systems. Ukrainian studies also point to differences in methodologies, indicators, and levels of data disaggregation between Ukraine and EU countries, emphasising the need for their harmonisation, as demonstrated in the field of preschool [13] and professional pre-higher education [14].

EMIS are widely recognised as key components of education data systems, supporting the collection, integration, and use of data for monitoring, planning, and policy development [15–17]. Ukrainian studies also underline the im-

portance of developing education registers and integrated information systems as key elements of the data infrastructure of education governance. Drawing on European experience, these studies emphasise the role of such systems in the collection, integration, and use of education data, as well as in supporting evidence-informed decision-making [18]. This is reflected in the development of national EMIS, in the Automated Information Complex of Educational Management (AICEM) [19] and the Unified State Electronic Database on Education in Ukraine (USEDE) [20].

Given the growing volume of scholarly research, the international system of education statistics can be viewed as a complex and evolving institutional framework. Existing studies provide important insights into its individual elements, such as governance actors, data systems, and policy instruments; however, a more comprehensive analysis of its multi-level structure and functional linkages requires further in-depth study.

The article aims to generalise international experience in the field of education statistics and to analyse its functioning in the contemporary context as a multi-level institutional system of education data governance. To achieve this aim, the following objective is pursued: to analyse the institutional structure, key actors, and functional characteristics of the international system of education statistics, with particular attention to the role of EMIS, as well as current trends related to digitalisation, data integration, interoperability, and the growing use of data in education governance.

The study employs a combination of theoretical generalisation and systematisation, a systems approach, and document analysis, complemented by an illustrative comparison of selected national approaches. These methods are used to examine the international system of education statistics as a multi-level institutional structure, to analyse national approaches to data organisation and EMIS development, and to review policy documents, analytical reports, and research literature on education data systems, with a focus on the systematisation and interpretation of international practices.

Results of the study. At the global scale, the system of education statistics is shaped by the interaction of key international institutions, notably the UNESCO Institute for Statistics (UIS) and the Organisation for Economic Co-operation and Development (OECD). Within the European context, the Statistical Office of the European Union (Eurostat) acts as the regional coordinator of education statistics, ensuring the harmonisation, consistency, and comparability of data within the European Statistical System (ESS), including the use of the Nomenclature of Territorial Units for Statistics (NUTS). In our study, particular attention is paid to the European Union (EU) as a highly institutionalised regional statistical system and as an important reference framework for countries undergoing processes of European integration, including Ukraine.

At the national level, education statistics are produced and managed by the respective national bodies. They are responsible for collecting, processing, and reporting data in accordance with national legislation and in line with international standards, thereby ensuring the integration of national data into regional and global statistical systems.

The three-level structure of the international system of education statistics is illustrated in Fig. 1, reflecting the distribution of key institutions across global, regional (EU), and national levels.

As illustrated in Fig. 1, the global level of the system is organised around the complementary roles of key international institutions. Rather than operating as independent actors, these institutions form a functionally differentiated and interdependent system of global education statistics governance.

The UIS [21] serves as the central coordinating institution at the global level, responsible for the development of international statistical standards and classifications (in particular ISCED), as well as for coordinating data collection and ensuring the international comparability of education indicators, including within the framework of monitoring SDG 4. In this role, UIS provides the methodological and standardisation backbone of the system.

The OECD [22] acts as a leading analytical centre within the system, focusing on the interpretation of statistical data, the development of indicators, and the production of analytical outputs to support evidence-based education policy. Through initiatives such as the Indicators of Education Systems (INES) and international assessments (e.g. PISA –

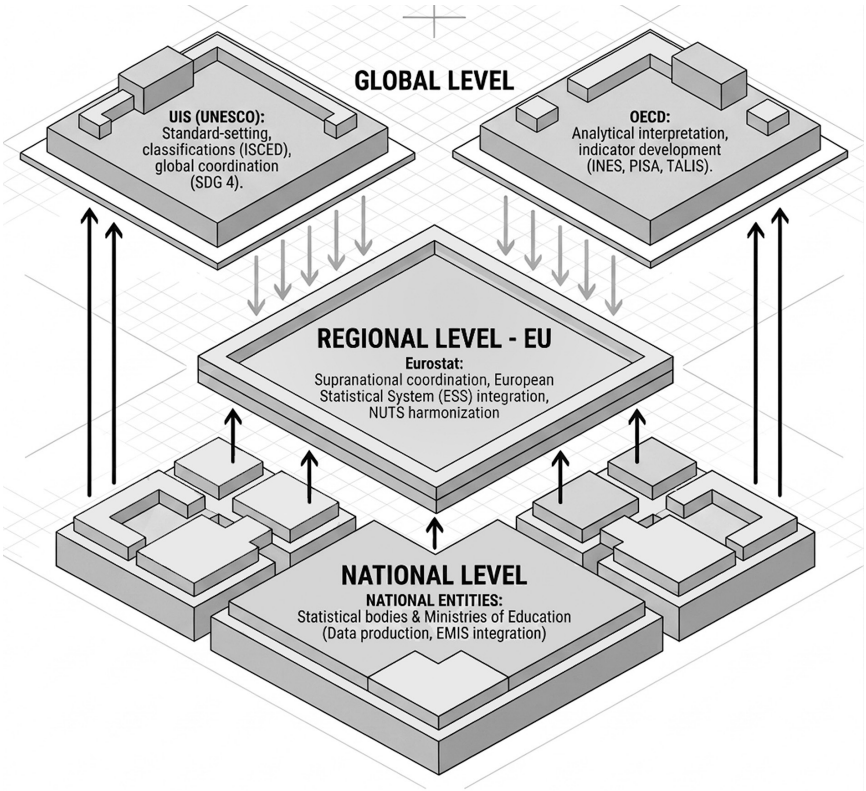

Figure 1. **Multi-level institutional structure of the international system of education statistics**

Created based on: [21–23].

the Programme for International Student Assessment, TALIS – the Teaching and Learning International Survey, and PIAAC – the Programme for the International Assessment of Adult Competencies). Thus, the OECD extends the system beyond data production towards analytical interpretation and policy-oriented knowledge generation.

Within the European context, Eurostat [23] is the regional coordinator of education statistics, ensuring the harmonisation, consistency, and comparability of data within the ESS. Its activities are aimed at integrating national statistical systems into a coherent European statistical framework and supporting the monitoring of European education strategies. This reflects the supranational dimension of the system, where global standards are operationalised and adapted within a regional governance framework.

The joint UNESCO–OECD–Eurostat (UOE) [24] initiative constitutes a key mechanism of interaction among international statistical institutions, ensuring the collection of internationally comparable data on formal education systems. It operates as a coordinated annual data collection process in which national statistical authorities and ministries of education submit standardised data in accordance with unified methodological requirements and classifications, including ISCED.

The UOE covers core dimensions of education systems, including participation, completion, human and financial resources, with data disaggregated by education levels, age, gender, and programme types, enabling cross-country comparability.

Institutionally, the UOE is based on a functional distribution of roles: the UIS ensures global coordination and coverage beyond OECD and EU countries, the OECD focuses on analytical use and indicator development (e.g. Education at a Glance), while Eurostat ensures data harmonisation and consistency within the European statistical framework. This model reduces duplication and ensures methodological consistency.

A high level of standardisation is ensured through common definitions, data collection manuals, and multi-stage validation procedures, which enhance data quality and comparability. The resulting data underpin key international indicators, including the monitoring of SDG 4, and are widely used in evidence-based policymaking.

The roles of key international organisations within the system of education statistics and their functional differentiation are summarised in Fig. 2.

The differentiation of functional roles among key international organisations, as presented in Fig. 2, reflects a coordinated institutional interaction within the UOE framework, which underpins data comparability and facilitates the effective use of education statistics in evidence-based policymaking.

While the core institutional framework of the international system of education statistics is formed by the coordinated activities of the above-mentioned organisations, its functioning is further supported by a broader set of international actors that contribute to the expansion of education-related data and analysis across different policy domains. In particular:

• The World Bank develops global data platforms such as EdStats and analytical tools, including the Systems Approach for Better Education Results (SABER) and the Human Capital Index

	UNESCO Institute for Statistics (UIS)	Organisation for Economic Co-operation and Development (OECD)	Statistical Office of the European Union (Eurostat)
Core Mandate	Central global coordinating body	Leading analytical centre	Supranational coordinator within ESS
Functional Dimension	Standard-setting & coordination (ISCED, SDG 4)	Data analysis, indicator development (Education at a Glance, PISA)	Data harmonisation and validation (ESS, NUTS)
Role in UOE	Global coordination and coverage beyond OECD/EU	Analytical processing and indicator use	Coordination and validation of EU data

Figure 2. **Functional differentiation of key international organisations within the system of education statistics**

Created based on: [21–23].

(HCI), supporting the integration of education indicators into human capital and policy analysis;

• The United Nations Children's Fund (UNICEF) monitors access to education and educational inequalities, particularly in relation to gender disparities and out-of-school children;

• The United Nations Development Programme (UNDP) integrates education indicators into broader development frameworks, notably through the Human Development Index (HDI);

• The International Labour Organization (ILO) provides indicators related to employment, skills, and labour market participation, supporting the analysis of education–labour market linkages;

• The World Health Organization (WHO) incorporates education-related aspects within the context of health, well-being, and school environments, highlighting intersectoral connections.

Together, these organisations extend the analytical scope of education statistics beyond the core statistical system, linking education data with broader socio-economic, labour market, and development processes. This broader constellation of actors reflects the increasing importance of cross-sectoral data integration and highlights the expanding role of education statistics within wider data ecosystems and human capital analysis.

Beyond the expansion of data and analytical inputs by international organisations, the European level of the system also incorporates dedicated analytical and information infrastructures, notably the Eurydice network [25]. Alongside Eurostat's statistical functions, Eurydice provides thematic and comparative reports, visual materials, analytical resources, and news items [12]. These outputs support cross-country analysis, comparability, and evidence-based policymaking by offering structured descriptions of national education structures, comparative studies on key topics, and data and visualisations across a wide range of education issues.

A key component of the Eurydice network is Eurypedia [26], an online encyclopaedia of European education systems, which provides systematic and standardised descriptions of national education structures within a unified analytical framework. The content is organised according to a common structure covering the core components of education structures, with additional sub-chapters developed within each thematic area. In general, this structure comprises the main components presented in the Table.

A distinctive feature of Eurypedia is the standardised presentation of statistical information on educational institutions, as outlined in sub-chapter 1.8 "Statistics on educational institutions". Across countries, such data are structured according to ISCED levels, types of institutions, ownership categories, and programme orientation, which enhances their comparability and analytical usability across countries. In particular, statistical information is primarily presented for ISCED levels 0–3 (in some cases extending to level 4), while data on tertiary education and adult learning are provided through complementary sources, such as the European Tertiary Education Register and a dedicated chapter on adult education (chapter 7).

Since 2024, the network has expanded its geographical coverage to include countries of the Eastern Partnership region, notably Ukraine, Georgia, and Mol-

Table

Thematic structure of Eurypedia as a standardised framework for describing national education structures

Chapter: thematic component	Scope of content	Analytical function
Chapter 1: Governance	Organisation, governance, and regulatory framework of national education structures	Provides the institutional and policy context for comparative description
Chapter 2: Funding	Financial arrangements and resource allocation in education	Supports analysis of resource distribution and funding mechanisms
Chapters 3–7: Education levels	Structured description of education stages from early childhood education and care to adult learning	Constitutes the core comparative backbone, enabling cross-country comparison of education provision and institutional structures
Chapter 8: Teachers	Teaching staff, qualifications, and working conditions	Provides insight into human resources and professional conditions
Chapter 9: Management staff	School leadership and administrative personnel	Reflects institutional management and organisational arrangements
Chapter 10: Quality assurance	Evaluation, monitoring, and quality assurance mechanisms	Supports comparative analysis of accountability and performance frameworks
Chapter 11: Support and guidance	Student support services and guidance mechanisms	Captures inclusiveness and support structures across education provision
Chapter 12: Mobility and internationalisation	Cross-border mobility and international cooperation	Reflects the external and transnational dimension of education
Chapter 13: Ongoing reforms	Policy developments and reform processes	Provides a dynamic perspective on recent changes in education policy and organisation over the most recent three-year period

Created based on: [26].

dova, which have become progressively involved in its activities. Eurydice currently comprises 43 national units. The potential re-engagement of the United Kingdom in Eurydice activities, possibly from 2027, may further strengthen comparative analysis and enhance the effectiveness of evidence-based education policy in Europe.

The functioning of these analytical infrastructures often depends on national-level institutions responsible for the collection, analysis, and use of education data. At this level, the institutional landscape is characterised by diverse organisational arrangements, with these functions in some cases performed within ministries of education, and in others delegated to specialised institutions, such as research institutes, policy advisory bodies, or education information system centres, typically operating under ministerial authority.

Despite differences in institutional status, these entities perform complementary roles, contributing to the provision of evidence for education policymaking. This diversity of institutional arrangements is illustrated by examples from several European countries:

- Education Information Technology Centre (Lithuania);
- Educational Research Institute (Poland);
- Finnish National Agency for Education (Finland);
- Information and Communication Technologies Centre in Education (Moldova);
- Institute of Educational Policy (Greece);
- National Education Institute (Slovenia);
- State Scientific Institution "Institute of Educational Analytics" (Ukraine).

These examples reflect a range of institutional models, from data management and information system administration to analytical and policy-support functions. Together, they highlight the increasing importance of integrating data production, analysis, and use within coherent frameworks that support data-driven governance and evidence-based education policymaking. In many cases, this integration is facilitated through the development and administration of national EMIS.

In this context, the integration of data across sectors increasingly relies on national data infrastructures, in particular EMIS, which operationalise these cross-sectoral linkages at the system level. EMIS can therefore be understood as key integrative components of the education data infrastructure. In the international context, both UNESCO and UNICEF recognise EMIS as core elements of education data systems that enable the systematic collection, processing, and use of data for monitoring, planning, and policy development [16; 17]. While the UNESCO approach emphasises the operational and system-level functions of EMIS in supporting data management and statistical production, UNICEF conceptualises EMIS more broadly as integrated systems encompassing the full data lifecycle – from data collection to analysis and use in decision-making – and combining technological, institutional, and procedural components.

Unlike fragmented administrative or statistical databases, EMIS functions as an integrated information infrastructure that combine technological solutions with institutional arrangements, governance mechanisms, and standardised procedures, ensuring the production and use of reliable and timely data

[27]. From a functional perspective, they transform administrative and statistical data into actionable information that supports policymaking, planning, and monitoring.

Within the international system of education statistics, EMIS can be understood as an integrative mechanism that connects national data production with processes of international harmonisation and policy-relevant analytical use. By enabling the alignment of data standards, coordination of data flows, and integration of diverse data sources, they support multi-level data governance and strengthen the comparability and usability of education statistics across countries [28].

At the same time, contemporary research highlights the evolving role of EMIS within broader digital education ecosystems. In this context, education data systems increasingly operate as interconnected digital infrastructures that form part of a wider ecosystem of data and technology tools, combining information on students, institutions, and educational processes. This enables more timely access to data and supports more responsive and evidence-informed decision-making [29].

Recent developments point to a transition from traditional EMIS towards more dynamic and integrated data systems (EMIS 2.0), characterised by interoperability, the integration of multiple data sources, and the increasing use of data in governance processes [28; 29]. This reflects a broader shift from data collection towards data integration and active data use within education governance systems. The evolutionary trajectory of EMIS development is presented in Fig. 3.

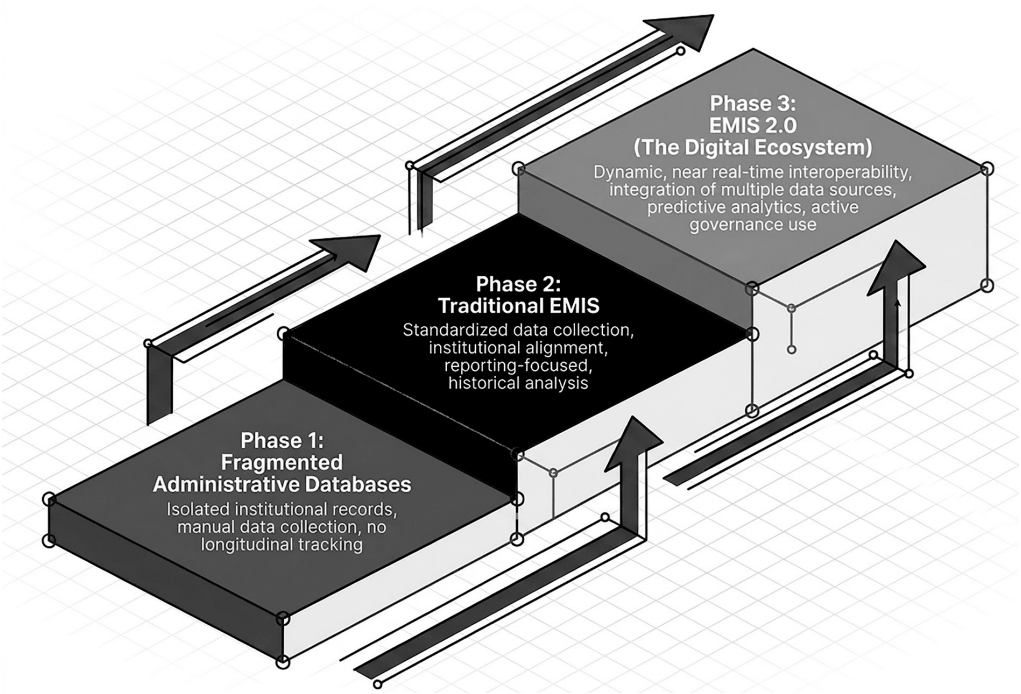

Figure 3. **Evolution of EMIS systems**

Created based on: [28; 29].

Empirical evidence from Europe and Central Asia further illustrates the diversity of national EMIS implementations. A regional study [26] covering 13 countries demonstrates that EMIS increasingly function as integrated systems covering multiple levels of education and supporting various stages of the data lifecycle. The study also highlights differences in institutional approaches to data governance, including the development of regulatory frameworks, data security policies, and data protection measures across countries.

At the national level, EMIS architectures reflect diverse governance models and system designs, ranging from decentralised or hybrid configurations that combine national registers with institutional platforms to more integrated system-level solutions [20]. These differences can be illustrated by selected country examples:

- Denmark – a register-based model of education data systems, where education statistics are organised through interconnected national administrative registers linked via a unique personal identifier, enabling longitudinal tracking across education, labour market participation, and other social domains, and supporting advanced analytical and policy evaluation;
- Estonia – the Estonian Education Information System (EHIS), complemented by platforms such as eKool and Stuudium, represents a multi-layered integrated system combining a central national database with widely used school-level digital tools, supporting near real-time or regularly updated data exchange, monitoring, and communication;
- Finland – the KOSKI register, combined with decentralised platforms such as Wilma, reflects a hybrid model combining national data integration with strong institutional autonomy;
- Poland – the System Informacji Oświatowej (SIO) and POL-on illustrate a functionally differentiated architecture, where separate national systems for school and higher education support data collection, monitoring, and funding, complemented by institutional platforms such as USOS;
- Ukraine – two main national EMIS operate at different levels of education: the AICEM, covering pre-primary, general secondary, vocational, professional pre-higher, and out-of-school education, and the USEDE, primarily covering higher education, with a gradual expansion of data coverage over time.

These examples illustrate the diversity of EMIS architectures and governance models across countries, reflecting different approaches to data integration, system coordination, and the use of education data in policymaking.

However, despite these advances, important limitations persist, particularly in relation to data quality, system interoperability, and the limited analytical use of available data, especially in the context of expanding data environments [30]. A key challenge is the persistent gap between data availability and its effective use in policymaking, which also raises concerns regarding the reliability and validity of education statistics.

As demonstrated in recent research [31], EMIS often generate substantial volumes of data that remain underutilised in decision-making processes due to governance constraints, institutional barriers, and weak integration into policy cycles. Empirical evidence further supports this argument: Kaindaneh et al. [32], applying the SABER-EMIS framework, identifies structural limita-

tions related to insufficient individual-level data and limited analytical capacity, which constrain the effective use of EMIS in education governance.

Despite significant progress in system development and data coverage, challenges related to interoperability, data integration, and the analytical use of data remain highly relevant, reflecting broader trends observed across many education systems. In addition, emerging risks related to cybersecurity and data protection are becoming increasingly important in the context of digitalisation and the growing reliance on integrated data infrastructures.

Looking ahead, further development of EMIS is increasingly associated with the integration of advanced digital technologies, including artificial intelligence, which can enhance data processing, predictive analytics, and decision support.

A particularly important direction is the expansion of EMIS beyond education-specific data towards integrated cross-sectoral data ecosystems. This emerging cross-sectoral role of EMIS is illustrated in Fig. 4.

These developments highlight key tendencies in the evolution of education statistics and data systems, including increasing digitalisation, the integration of heterogeneous data sources, and the growing role of advanced analytical tools, particularly artificial intelligence. At the same time, persistent challenges related to interoperability,

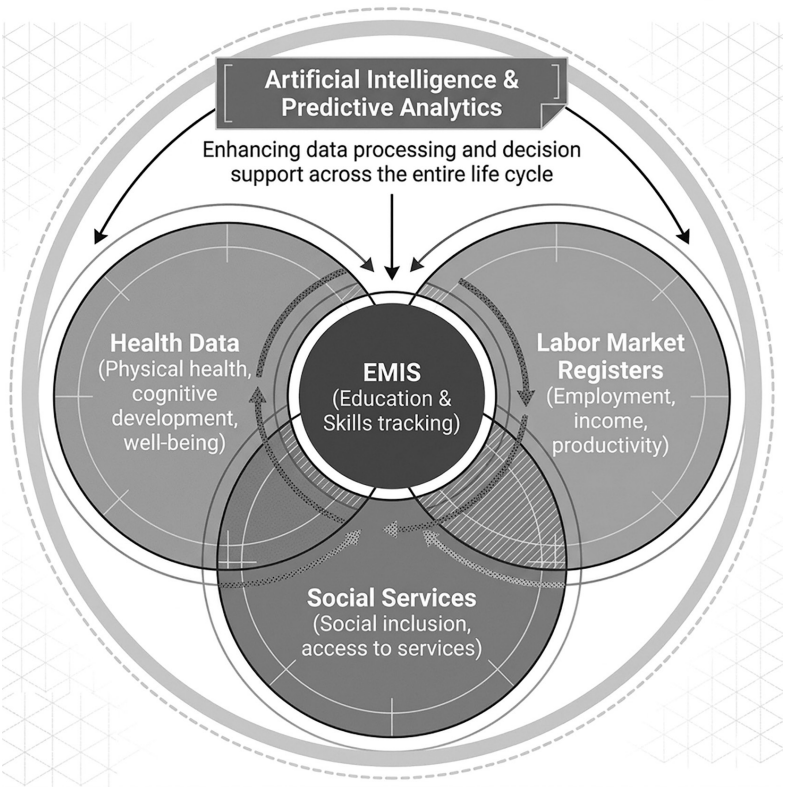

Figure 4. **Cross-sectoral integration of EMIS**

Created by the authors.

cybersecurity, and institutional capacity underscore the need to strengthen both technical and governance frameworks to ensure the effective, responsible, and sustainable use of education data. In this context, the ongoing transformation of EMIS reflects a broader shift towards integrated, data-driven approaches to education governance, positioning EMIS as core infrastructure within modern education data systems.

Thus, our study provides a basis for conceptualising the international system of education statistics as a multi-level data governance framework and for identifying the integrative role of EMIS within this system, which comprises:

- global standard-setting and coordination;
- regional harmonisation and integration;
- national data production and system-level implementation through EMIS.

Conclusions. Our study provides a comprehensive examination of the international system of education statistics as a multi-level institutional structure, integrating global, regional (namely the EU), and national levels through coordinated mechanisms such as the UOE data collection. It systematises the institutional architecture of the system and clarifies the functional differentiation of key actors, demonstrating the complementary roles of the UIS in standard-setting and coordination, the OECD in analytical interpretation and indicator development, and Eurostat in ensuring harmonisation within the ESS. The analysis also highlights the role of Eurydice as a key analytical and information resource in expanding the comparative and contextual understanding of education systems.

At the national level, the study shows that EMIS functions as a key integrative component linking data production, harmonisation, and analytical use. The comparison of selected countries illustrates the diversity of EMIS architectures, including register-based, integrated, hybrid, and functionally differentiated models, highlighting the existence of highly diversified national approaches to the organisation of education data systems, shaped by different governance models and operationalised through EMIS.

The findings indicate that the development of education statistics is closely associated with broader transformations towards data-driven governance, characterised by digitalisation, the integration of heterogeneous data sources, and the growing role of analytical tools. Overall, the international system of education statistics can be conceptualised as an emerging integrated data governance framework, in which EMIS play a central linking role. Despite these advances, persistent challenges remain, particularly in relation to data integration, interoperability, analytical capacity, and the effective use of data in policymaking.

The analysis further demonstrates that the effectiveness of education data systems increasingly depends on the capacity to integrate data across sectors, including education, health, labour market, and social domains, which is essential for supporting more comprehensive and evidence-based policy analysis. In this context, the transition towards integrated and cross-sectoral data ecosystems represents a key direction for the further development of education statistics. Addressing existing challenges is critical for strengthening

education data systems and ensuring their role as a foundation for effective and sustainable governance, while also highlighting important implications for policy development, human capital development, and future research.

References

1. Koenen, E., Schwarzenegger, C. & Kittler, J. (2021). Data(fication): "Understanding the World Through Data" as an Everlasting Revolution. In *Digital Roots: Historicizing Media and Communication Concepts of the Digital Age* (pp. 137-156). Berlin, Boston: De Gruyter Oldenbourg. DOI: https://doi.org/10.1515/9783110740202-008.

2. OECD (2019). *The Path to Becoming a Data-Driven Public Sector*. Paris: OECD Publishing. DOI: https://doi.org/10.1787/059814a7-en.

3. Fobia, A. C., Holzberg, J., Eggleston, C., Childs, J. H., Marlar, J., & Morales, G. (2019). Attitudes towards Data Linkage for Evidence-Based Policymaking. *Public Opinion Quarterly*, *83*(S1), 264-279. DOI: https://doi.org/10.1093/poq/nfz008.

4. Tebrake, J. (2026). The future of international macroeconomic statistical standards: Toward a coordinated and adaptive research agenda. *Statistical Journal of the IAOS, 42*(1), 113-121. DOI: https://doi.org/10.1177/18747655261419930.

5. Jacobsson, S., & Oskarsson, C. (1995). Educational statistics as an indicator of technological activity. *Research Policy*, *24*(1), 127-136. DOI: https://doi.org/10.1016/0048-7333(93)00753-G.

6. Londar, S., & Horna, M. (2021). Education statistics and monitoring tools for achieving the 4st goal of sustainable development. *Educational Analytics of Ukraine*, *2(13),* 5-19. DOI: https://doi.org/10.32987/2617-8532-2021-2-5-19 [in Ukrainian].

7. Williamson, B., & Piattoeva, N. (2019). Objectivity as standardization in data-scientific education policy, technology and governance. *Learning, Media and Technology*, *44*(1), 64-76. DOI: https://doi.org/10.1080/17439884.2018.1556215.

8. Anderson, E. R., & Colyvas, J. A. (2021). What Sticks and Why? A MoRe Institutional Framework for Education Research. *Teachers College Record: The Voice of Scholarship in Education*, *123*(7), 1-34. DOI: https://doi.org/10.1177/016146812112300705.

9. Elfert, M., & Ydesen, C. (2023). UNESCO, the OECD and the World Bank: A Global Governance Perspective. In *Global Governance of Education. Educational Governance Research*, *24*. Springer, Cham. DOI: https://doi.org/10.1007/978-3-031-40411-5_2.

10. Vaccari, V., & Gardinier, M. P. (2019). Toward one world or many? A comparative analysis of OECD and UNESCO global education policy documents. *International Journal of Development Education and Global Learning*, *11*(1), 68-86. DOI: https://doi.org/10.18546/IJDEGL.11.1.05.

11. Voznyuk, L. (2025). Influence of state educational policy on the development and management of educational institutions. *Dnipro Academy of Continuing Education Herald. Series: Public Management and Administration*, *1*(1), 87-95. DOI: https://doi.org/10.54891/2786-698X-2025-1-10 [in Ukrainian].

12. Husak, O., Shkabko, S., Lytvynchuk, A., & Pron, N. (2025). Harmonising Ukrainian education policy with European standards: The role of the Eurydice network. *Educational Analytics of Ukraine, 4(36),* 5-15. DOI: https://doi.org/10.32987/2617-8532-2025-4-5-15.

13. Tkachenko, V. (2025). Harmonization of international classifications in statistics on preschool education in Ukraine: review and analysis of compliance. *Educational Analytics of Ukraine, 4(36),* 83-95. DOI: https://doi.org/10.32987/2617-8532-2025-4-83-95 [in Ukrainian].

14. Lyesnikova, M. V. (2025). Comparative analysis of educational statistics in the field of professional pre-higher education in the European Union countries and Ukraine. *Educational Analytics of Ukraine, 3(35)*, 82-93. DOI: https://doi.org/10.32987/2617-8532-2025-3-82-93 [in Ukrainian].

15. Asio, J. M. R., Leva, E. F., Lucero, L. C., & Cabrera, W. C. (2022). Education Management Information System (EMIS) and Its Implications to Educational Policy: A Mini-Review. *International Journal of Multidisciplinary: Applied Business and Education Research*, *3*(8), 1389-1398. DOI: https://doi.org/10.11594/ijmaber.03.08.01.

16. UNESCO-UIS. (2020). *Operational guide to using EMIS to monitor SDG 4*. Retrieved from https://emis.uis.unesco.org/wp-content/uploads/sites/5/2020/09/EMIS-Operational-Guide-EN-WEB.pdf.

17. UNICEF. (2023). *Education management information system in Europe and Central Asia: In-depth review of 13 countries*. Retrieved from https://www.unicef.org/eca/media/28136/file/Education%20management%20information%20system%20in%20Europe%20and%20Central%20Asia.pdf.

18. Tereshchenko, H., Kyrianov, A., & Solohub, Ya. (2025). Methodology and tools of systems analysis as a basis for the development of national education management information systems. *Educational Analytics of Ukraine, 5(37),* 47-58. DOI: https://doi.org/10.32987/2617-8532-2025-5-47-58 [in Ukrainian].

19. Lytvynchuk, A., Kyrianov, A., & Irynevych, J. (2020). Purpose and directions of modernization of the hardware-software complex "Automated information complex of educational management". *Educational Analytics of Ukraine, 4(11),* 102-112. DOI: https://doi.org/10.32987/2617-8532-2020-4-102-112 [in Ukrainian].

20. Puhachova, M. V. (2021). Registers of the education system in European countries: useful practices for Ukraine. *Statistics of Ukraine*, *92*(1), 58-68. DOI: https://doi.org/10.31767/su.1(92)2021.01.06 [in Ukrainian].

21. UNESCO-UIS. (n. d.). *UIS database*. Retrieved from https://www.uis.unesco.org/en.

22. Organisation for Economic Co-operation and Development (OECD). (n. d.). *About the OECD.* Retrieved from https://www.oecd.org/.

23. Eurostat. (n. d.). *Welcome to Eurostat*. Retrieved from https://ec.europa.eu/eurostat.

24. Eurostat. (2025). *UNESCO OECD Eurostat (UOE) joint data collection – methodology.* Retrieved from https://surl.li/bwkqlc.

25. European Commission. (n. d.). *Eurydice*. Retrieved https://eurydice.eacea.ec.europa.eu/.

26. Eurydice. (n. d.). *National Education Systems*. Retrieved from https://eurydice.eacea.ec.europa.eu/eurypedia.

27. Lytvynchuk, A., Tereshchenko, H., Anisimova, O., & Kyrianov A. (2023). Automated gathering and visualization of targeted educational subvention data as part of the digital transformation of education governance. *Educational Analytics of Ukraine*, *5(26),* 47-63. DOI: https://doi.org/10.32987/2617-8532-2023-5-47-63 [in Ukrainian].

28. International Development Research Centre. (2024). *Education data systems and data use: A research synthesis*. Retrieved from https://www.gpekix.org/sites/default/files/2025-02/Data%20Research%20Synthesis%20EN%20Final.pdf.

29. OECD. (2023). *OECD digital education outlook 2023: Towards an effective digital education ecosystem*. DOI: https://doi.org/10.1787/c74f03de-en.

30. Forrester, V. V. (2019). School management information systems: Challenges to educational decision-making in the big data era. *International Journal on Integrating Technology in Education, 8*(1), 1-11. DOI: https://doi.org/10.5121/ijite.2019.8101.

31. El Mazbouh, M., Shah, R., & Lee, K. (2025). If evidence matters, why does the data die? Implementing education management information systems (EMIS) in development contexts. *Frontiers in Education*, *10*, 1616717. DOI: https://doi.org/10.3389/feduc.2025.1616717.

32. Kaindaneh, S., Kadt, Ju., Bechange, S., Jolley, E., Smart, N., & Schmidt, E. (2024). An assessment of the Education Management Information System in Sierra Leone and potential for enhanced disability inclusiveness. *International Journal of Educational Research Open*, *7*, 100399. DOI: https://doi.org/10.1016/j.ijedro.2024.100399.

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МІЖНАРОДНІ ПІДХОДИ ДО РОЗВИТКУ СТАТИСТИКИ ОСВІТИ: ІНСТИТУЦІЙНА АРХІТЕКТУРА ТА СУЧАСНІ ПРАКТИКИ

Анотація. *Зростання ролі даних в управлінні освітою актуалізує питання розвитку статистики освіти як ключового інструмента інформаційного забезпечення освітньої політики. Метою нашого дослідження є узагальнення міжнародного досвіду у сфері статистики освіти та аналіз її функціонування в сучасних умовах як багаторівневої інституційної системи управління освітніми даними. У статті проаналізовано організаційну структуру міжнародної системи освітньої статистики з виокремленням глобального, регіонального (зокрема ЄС) і національного рівнів; визначено ролі ключових акторів, у т. ч. Інституту статистики ЮНЕСКО, ОЕСР та Євростату. Особливу увагу приділено координаційним механізмам, насамперед спільному збору даних UOE (UNESCO–OECD–Eurostat), що забезпечує порівнюваність і узгодженість статистичної інформації між країнами. Розкрито значення аналітико-інформаційної мережі Eurydice у формуванні порівняльної й актуальної інформації про європейські освітні системи. Показано, що інформаційні системи управління освітою (EMIS) виступають ключовими інтеграційними компонентами національних систем освітніх даних, забезпечуючи зв'язок між процесами збору, узгодження та аналітичного використання інформації. Порівняльний аналіз окремих країн засвідчує різноманітність архітектур EMIS і моделей управління даними, що відображає відмінності в національних підходах до формування освітньої інформації. Визначено основні тенденції розвитку освітньої статистики, як-от: цифровізація, інтеграція*

різних джерел даних та збільшення ролі аналітичних інструментів. Також окреслено ключові виклики, пов'язані з інтероперабельністю, аналітичною спроможністю й ефективним використанням даних у процесах прийняття рішень. Перспективними напрямами подальших досліджень є підходи, пов'язані із переходом до інтегрованих міжсекторальних екосистем даних, зокрема через поєднання освітніх даних зі сферою охорони здоров'я, ринком праці та соціальною політикою, що створює можливості для комплексного аналізу розвитку людського капіталу.

Ключові слова: *статистика освіти, освітні дані, інформаційна система управління освітою (EMIS), управління даними, міжнародна система освітньої статистики, формування політики на основі даних.*

Список використаних джерел

1. *Koenen E., Schwarzenegger C., Kittler J.* Data(fication): «Understanding the World Through Data» as an Everlasting Revolution. *Digital Roots: Historicizing Media and Communication Concepts of the Digital Age* / ed. by G. Balbi, N. Ribeiro, V. Schafer, C. Schwarzenegger. Berlin, Boston : De Gruyter Oldenbourg, 2021. P. 137–156. DOI: https://doi.org/10.1515/9783110740202-008.

2. The Path to Becoming a Data-Driven Public Sector / OECD. Paris : OECD Publishing, 2019. DOI: https://doi.org/10.1787/059814a7-en.

3. Attitudes towards Data Linkage for Evidence-Based Policymaking / A. C. Fobia et al. *Public Opinion Quarterly*. 2019. Vol. 83, Iss. S1. P. 264–279. DOI: https://doi.org/10.1093/poq/nfz008.

4. *Tebrake J.* The future of international macroeconomic statistical standards: Toward a coordinated and adaptive research agenda. *Statistical Journal of the IAOS*. 2026. Vol. 42, No. 1. P. 113–121. DOI: https://doi.org/10.1177/18747655261419930.

5. *Jacobsson S., Oskarsson C.* Educational statistics as an indicator of technological activity. *Research Policy*. 1995. Vol. 24, Iss. 1. P. 127–136. DOI: https://doi.org/10.1016/0048-7333(93)00753-G.

6. *Лондар С. Л., Горна М. О.* Розвиток міжнародної статистики освіти для забезпечення моніторингу досягнення 4-ї цілі сталого розвитку. *Освітня аналітика України*. 2021. № 2 (13). С. 5–19. DOI: https://doi.org/10.32987/2617-8532-2021-2-5-19.

7. *Williamson B., Piattoeva N.* Objectivity as standardization in data-scientific education policy, technology and governance. *Learning, Media and Technology*. 2019. Vol. 44, Iss. 1. P. 64–76. DOI: https://doi.org/10.1080/17439884.2018.1556215.

8. *Anderson E. R., Colyvas J. A.* What sticks and why? A MoRe institutional framework for education research. *Teachers College Record: The Voice of Scholarship in Education*. 2021. Vol. 123, Iss. 7. P. 1–32. DOI: https://doi.org/10.1177/016146812112300705.

9. *Elfert M., Ydesen C.* UNESCO, the OECD and the World Bank: A Global Governance Perspective. *Global Governance of Education. Educational Governance Research.* 2023. Vol. 24. Springer, Cham. DOI: https://doi.org/10.1007/978-3-031-40411-5_2.

10. *Vaccari V., Gardinier M. P.* Toward one world or many? A comparative analysis of OECD and UNESCO global education policy documents. *International Journal of Development Education and Global Learning*. 2019. Vol. 11, Iss. 1. P. 68–86. DOI: https://doi.org/10.18546/IJDEGL.11.1.05.

11. *Вознюк Л.* Вплив державної освітньої політики на розвиток та управління закладами освіти. *Вісник Дніпровської академії неперервної освіти. Сер. : Публічне управління та адміністрування*. 2025. Т. 1. № 1. С. 87–95. DOI: https://doi.org/10.54891/2786-698X-2025-1-10.

12. *Гусак О., Шкабко С., Литвинчук А., Пронь Н.* Гармонізація української освітньої політики з європейськими стандартами: роль мережі Eurydice. *Освітня аналітика України*. 2025. № 4 (36). С. 5–15. DOI: https://doi.org/10.32987/2617-8532-2025-4-5-15.

13. *Ткаченко В.* Гармонізація міжнародних класифікацій у статистиці дошкільної освіти України: огляд та аналіз відповідності. *Освітня аналітика України*. 2025. № 4 (36). С. 83–95. DOI: https://doi.org/10.32987/2617-8532-2025-4-83-95.

14. *Лєснікова М. В.* Порівняльний аналіз освітньої статистики у сфері фахової передвищої освіти країн Європейського Союзу та України. *Освітня аналітика України*. 2025. № 3 (35). С. 82–93. DOI: https://doi.org/10.32987/2617-8532-2025-3-82-93.

15. *Asio J. M. R., Leva E. F., Lucero L. C., Cabrera W. C.* Education Management Information System (EMIS) and Its Implications to Educational Policy: A Mini-Review. *International Journal of Multidisciplinary: Applied Business and Education Research*. 2022. Vol. 3, No. 8. P. 1389–1398. DOI: https://doi.org/10.11594/ijmaber.03.08.01.

16. Operational guide to using EMIS to monitor SDG 4 / UNESCO-UIS. 2020. URL: https://emis.uis.unesco.org/wp-content/uploads/sites/5/2020/09/EMIS-Operational-Guide-EN-WEB.pdf.

17. Education management information system in Europe and Central Asia: In-depth review of 13 countries / UNICEF. 2023. URL: https://www.unicef.org/eca/media/28136/file/Education%20management%20information%20system%20in%20Europe%20and%20Central%20Asia.pdf.

18. *Терещенко Г., Кир'янов А., Сологуб Я*. Методологія та інструменти системного аналізу як основа розвитку національних систем управління освітою. *Освітня аналітика України*. 2025. № 5 (37). С. 47–58. DOI: https://doi.org/10.32987/2617-8532-2025-5-47-58.

19. *Литвинчук А., Кир'янов А., Іриневич Ю.* Мета та напрями модернізації програмно-апаратного комплексу «Автоматизований інформаційний комплекс освітнього менеджменту». *Освітня аналітика України*. 2020. № 4 (11). С. 102–112. DOI: https://doi.org/10.32987/2617-8532-2020-4-102-112.

20. *Пугачова М. В.* Реєстри системи освіти в європейських країнах: корисний досвід для України. *Статистика України*. 2021. Т. 92. № 1 С. 58–68. DOI: https://doi.org/10.31767/su.1(92)2021.01.06.

21. UIS database / UNESCO-UIS. URL: https://www.uis.unesco.org/en.

22. About the OECD / Organisation for Economic Co-operation and Development (OECD). URL: https://www.oecd.org/.

23. Welcome to Eurostat / Eurostat. URL: https://ec.europa.eu/eurostat.

24. UNESCO OECD Eurostat (UOE) joint data collection – methodology / Eurostat. 2025. URL: https://surl.li/bwkqlc.

25. Eurydice / European Commission. URL: https://eurydice.eacea.ec.europa.eu/.

26. National Education Systems / Eurydice. URL: https://eurydice.eacea.ec.europa.eu/eurypedia.

27. *Литвинчук А. О., Терещенко Г. М., Анісімова О. Ю., Кир'янов А. В.* Забезпечення автоматизації збору та представлення даних про використання коштів цільових освітніх субвенцій як складова цифрової трансформації управління освітою. *Освітня аналітика України*. 2023. № 5 (26). С. 47–63. DOI: https://doi.org/10.32987/2617-8532-2023-5-47-63.

28. Education data systems and data use: A research synthesis / International Development Research Centre. 2024. URL: https://www.gpekix.org/sites/default/files/2025-02/Data%20Research%20Synthesis%20EN%20Final.pdf.

29. OECD digital education outlook 2023: Towards an effective digital education ecosystem / OECD. 2023. DOI: https://doi.org/10.1787/c74f03de-en.

30. *Forrester V. V.* School management information systems: Challenges to educational decision-making in the big data era. *International Journal on Integrating Technology in Education.* 2019. Vol. 8, No. 1. P. 1–11. DOI: https://doi.org/10.5121/ijite.2019.8101.

31. *El Mazbouh M., Shah R., Lee K.* If evidence matters, why does the data die? Implementing education management information systems (EMIS) in development contexts. *Frontiers in Education*. 2025. Vol. 10, 1616717. DOI: https://doi.org/10.3389/feduc.2025.1616717.

32. An assessment of the Education Management Information System in Sierra Leone and potential for enhanced disability inclusiveness / S. Kaindaneh et al. *International Journal of Educational Research Open*. 2024. Vol. 7, 100399. DOI: https://doi.org/10.1016/j.ijedro.2024.100399.