

Original article

The Future of Education: Integrating Digital Transformation, Sustainability, and Institutional Resilience

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Abstract

Education systems are currently experiencing rapid digital transformation, driven by advances in educational technology, artificial intelligence, and data-informed decision-making. Yet many institutional initiatives remain focused primarily on technological adoption rather than deeper organisational change. Emerging discussions around Industry 5.0 introduce a broader perspective that emphasises human well-being, sustainability, and resilience alongside technological progress. This conceptual article suggests that educational transformation should be approached through a whole-institution perspective in which digital innovation, sustainability, and institutional governance are considered together rather than as separate initiatives. Drawing on insights from a sustainability baseline conducted in a private high school operating within an international curriculum context in Türkiye, the article introduces the Whole-Institution Sustainability and Digital Transformation (WISDT) framework. The framework integrates operational sustainability, human well-being, and strategic digital integration as mutually reinforcing dimensions of school development. The discussion highlights implications for school leadership, institutional governance, and policy frameworks concerned with education for sustainable development. Ultimately, the future of education will depend less on the rapid adoption of new technologies and more on the ability of educational institutions to build adaptive, sustainable, and human-centred systems capable of navigating long-term change.

Keywords: Digital Transformation, Education for Sustainable Development, Educational Leadership, Industry 5.0, Institutional Resilience, Sustainability in Education.

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INTRODUCTION

Education systems worldwide are undergoing an accelerated phase of digital transformation. Developments in educational technology, artificial intelligence, and learning analytics are reshaping teaching practices, institutional management, and decision-making processes. These developments are frequently presented in terms of efficiency, innovation, and expanded access to learning opportunities. At the policy level, global discussions increasingly emphasise the need to align technological progress with broader societal priorities and sustainable development goals in education (UNESCO, 2024).

The emerging discourse surrounding Industry 5.0 highlights the importance of combining technological advancement with human well-being, sustainability, and organisational resilience (European Commission, 2021). These concerns also resonate with the global commitment to the United Nations Sustainable Development Goals (SDGs). In particular, SDG 4 (Quality Education) and SDG 13 (Climate Action) emphasise the responsibility of education systems not only to improve learning outcomes but also to contribute to sustainable development and environmental responsibility. Despite these ambitions, digital transformation in education often unfolds unevenly. Schools frequently invest in digital infrastructure or isolated innovation initiatives without corresponding changes in leadership practices, governance systems, or sustainability strategies (OECD, 2020). As a result, technological adoption may improve certain aspects of schooling while leaving deeper organisational structures largely unchanged.

Recent research also emphasises the role of education systems in supporting broader sustainability transitions by fostering environmental awareness, institutional responsibility, and future-oriented competencies (Leal Filho et al., 2021). This article therefore suggests that the transition toward Education 5.0 requires a broader institutional perspective. Digital transformation, sustainability, and organisational resilience should be understood as interconnected dimensions of school development rather than separate reform agendas.

Much of the current discourse surrounding educational technology focuses on the transformative potential of digital tools. Recent systematic reviews show that while digital technologies are widely adopted across education systems, their impact on institutional transformation often remains uneven and dependent on organisational capacity and leadership structures (Bond et al., 2024). Schools invest in learning platforms, data systems, and digital infrastructures with the expectation that these innovations will enhance teaching practices or improve institutional efficiency. In practice, however, technological adoption rarely transforms organisations on its own. Governance structures, professional learning systems, and institutional cultures often remain unchanged even as digital tools are introduced into everyday practice. Selwyn (2016) observes that educational technologies are frequently implemented within existing organisational frameworks rather than reshaping them.

From this perspective, digital transformation becomes less about technology itself and more about the institutional conditions that support meaningful change. Without attention to leadership, governance, and organisational culture, technological innovation risks remaining superficial. The Industry 5.0 discourse challenges this narrow technological focus. Instead, it emphasises the need to align technological innovation with human needs, sustainability goals, and organisational resilience (European Commission, 2021). Applied to education, this study encourages schools to consider digital transformation as part of a broader organisational evolution.

Industry 5.0 highlights three interrelated principles that have clear relevance for education systems.

1) Human-centredness: emphasising well-being, meaningful engagement with technology, and inclusive learning environments;

2) Sustainability: requiring institutions to consider environmental, social, and financial impacts in their strategic decision-making;

3) Resilience: referring to the capacity of organisations to adapt to uncertainty, disruption, and long-term change.

Schools, as complex social organisations, are well positioned to operationalise these principles. However, doing so requires moving beyond isolated innovation projects toward integrated institutional strategies that connect digital transformation with sustainability governance and organisational learning. These ideas also align with broader discussions of Education 5.0, which emphasise future-oriented learning environments, interdisciplinary innovation, and the development of adaptive educational institutions (Fisk, 2017).

Despite growing interest in digital transformation and sustainability in education, much of the existing literature examines these domains separately. Studies often focus either on technological innovation or on sustainability-oriented educational practices, with limited attention to how these dimensions interact at the institutional level. As a result, schools frequently adopt digital tools or sustainability initiatives in fragmented ways without integrating them into coherent governance systems. This conceptual article addresses this gap by proposing the Whole-Institution Sustainability and Digital Transformation (WISDT) framework, which conceptualises digital integration, human sustainability, and operational sustainability as interconnected dimensions of institutional development. The framework is informed by an exploratory sustainability baseline assessment conducted in a private international high school context in Türkiye.

METHODS

Research Design

To inform the conceptual development of the WISDT framework, an exploratory sustainability baseline assessment was conducted in a private high school operating within an international curriculum context in Türkiye. The purpose of the assessment was to develop an initial institutional overview of sustainability-related practices across operational, organisational, and digital governance dimensions.

The assessment relied on multiple internal institutional data sources, including administrative reports, operational indicators such as energy consumption and resource use, financial planning documents, and institutional discussions related to staff workload, well-being, and organisational climate. These sources provided qualitative insights into how sustainability considerations intersect with digital governance and organisational development.

Rather than functioning as a formal quantitative sustainability audit, the baseline assessment was designed as an exploratory institutional review. Exploratory institutional analysis is commonly used to identify emerging patterns and relationships that may inform conceptual model development (Creswell & Creswell, 2018). The analysis focused on identifying institutional indicators related to operational sustainability, human sustainability, and digital governance structures

RESULTS

To inform the conceptual development of the WISDT framework, an exploratory sustainability baseline assessment was conducted to develop an initial institutional overview of sustainability-related practices and indicators across operational, environmental, and organisational dimensions. The baseline assessment highlighted several emerging patterns relevant to institutional sustainability governance (Table 1).

Table 1. Institutional sustainability baseline indicators

Dimension	Example Indicators	Institutional Relevance
Operational sustainability	Energy consumption, resource use, financial efficiency	Links environmental performance with operational cost management
Human sustainability	Staff workload, professional collaboration, organisational climate	Influences institutional well-being and teacher capacity
Strategic digital integration	Data systems, digital platforms, decision-support tools	Enables integrated monitoring of institutional indicators

These baseline indicators also suggest that sustainability challenges in educational institutions are rarely confined to a single domain. Operational issues such as energy consumption and resource use often intersect with financial planning and institutional governance. Similarly, staff workload structures

and organisational culture influence the capacity of schools to implement digital innovation initiatives effectively.

The baseline observations therefore highlight the need for integrated monitoring systems capable of connecting operational, human, and digital indicators. Without such integration, institutional initiatives related to sustainability or digital transformation may remain fragmented across administrative units. These findings support the rationale for a whole-institution framework capable of aligning sustainability governance with digital decision-making infrastructures.

These insights informed the conceptual formulation of the Whole-Institution Sustainability and Digital Transformation (WISDT) framework presented in this article. Building on these observations, this article proposes the Whole-Institution Sustainability and Digital Transformation (WISDT) framework (Figure 1). The model builds on whole-institution approaches to sustainability in education, which emphasise the integration of environmental, organisational, and pedagogical dimensions of institutional development (Sterling, 2016).

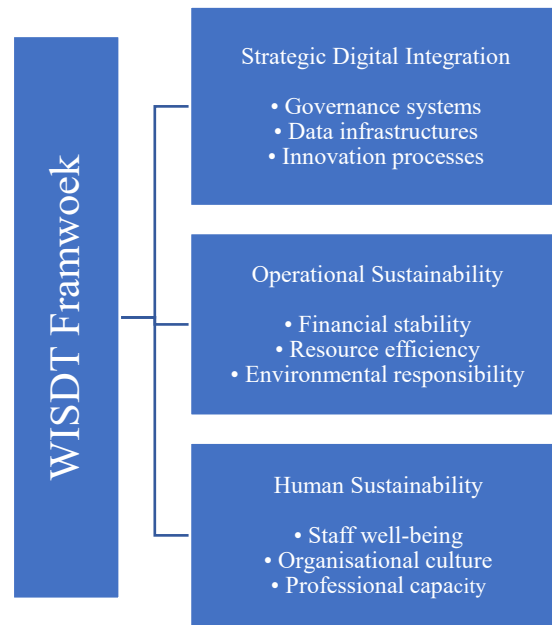


Figure 1. Conceptual representation of the Whole-Institution Sustainability and Digital Transformation (WISDT) framework

The framework conceptualises school development across three interconnected domains:

- 1) Operational sustainability: financial stability, resource efficiency, and environmental responsibility
- 2) Human sustainability: staff well-being, organisational culture, and professional capacity
- 3) Strategic digital integration: governance systems, data infrastructures, and innovation processes.

These domains are mutually reinforcing. For instance, energy consumption may represent both an environmental concern and a financial cost driver, while staff workload structures influence organisational well-being and institutional performance. Integrating these indicators within leadership dashboards and governance systems can support more informed decision-making and long-term planning. In this sense, digital systems developed for operational monitoring may simultaneously support environmental tracking, financial planning, and staff well-being assessments. From a leadership perspective, this integration shifts the role of school leaders. Rather than functioning primarily as technology managers, leaders increasingly act as system architects, responsible for aligning innovation, sustainability, and organisational culture within coherent institutional strategies (Dexter, 2018).

DISCUSSION

The transition toward Education 5.0 has important implications for both practitioners and policymakers. First, leadership preparation programmes may need to expand beyond traditional instructional leadership models. School leaders increasingly operate at the intersection of technological innovation, sustainability governance, and organisational development. Competencies related to systems thinking, digital governance, and sustainability literacy are therefore becoming increasingly important. Second, policy frameworks should recognise sustainability as a core component of digital transformation strategies. Investments in educational technology carry long-term implications for energy consumption, financial sustainability, and workforce capacity. Policymakers must therefore consider lifecycle costs, sustainability implications, and institutional resilience when designing digitalisation initiatives (UNESCO, 2017; OECD, 2025). Scholars have also highlighted the importance of embedding sustainability principles within the governance structures of education systems rather than treating them as isolated curricular initiatives (Sterling, 2016). Finally, schools should cultivate innovation ecosystems that support collaboration, professional learning, and experimentation. Industry 5.0 emphasises co-creation and human-technology collaboration, principles that resonate strongly with theories of learning organisations (Senge, 1990).

Education 5.0 represents more than an extension of digitalisation. It reflects a broader vision of educational transformation in which technology supports sustainable innovation and human development. Within this vision, schools evolve into adaptive learning organisations capable of continuous improvement. Digital tools support evidence-informed decision-making, while sustainability principles guide long-term institutional planning in increasingly complex education systems (OECD, 2025). Sustainability-oriented learning approaches increasingly emphasise the importance of developing adaptive capacities and systems thinking within educational institutions (Wals, 2020). Institutions that successfully integrate these perspectives are more likely to strengthen resilience and maintain stakeholder trust in increasingly complex educational environments.

The WISDT framework contributes to the emerging literature that conceptualises educational institutions as complex adaptive systems. Rather than viewing digital transformation solely as a technological process, the framework highlights the importance of institutional governance, organisational culture, and sustainability-oriented leadership. Similar perspectives have been emphasised in recent discussions on systemic educational innovation and sustainability transitions within education systems.

From this perspective, the integration of digital governance systems with sustainability indicators may support more adaptive institutional decision-making. Leadership dashboards that combine environmental, organisational, and operational data may help school leaders identify emerging risks, allocate resources more strategically, and strengthen institutional resilience over time.

CONCLUSION and RECOMMENDATIONS

As education systems move toward the emerging paradigm of Industry 5.0, the central challenge lies not simply in adopting new technologies. Instead, the more significant task is ensuring that digital innovation is aligned with sustainability, institutional resilience, and human well-being. The Whole-Institution Sustainability and Digital Transformation (WISDT) framework proposed in this conceptual article highlights the value of integrating operational sustainability, organisational culture, and digital governance within a coherent institutional strategy. Ultimately, the future of education will depend less on the sophistication of technological tools and more on the wisdom of the systems that guide their use - systems capable of balancing innovation with sustainability, efficiency with well-being, and progress with long-term purpose.

This study has several limitations. First, the sustainability baseline assessment was exploratory and conducted within a single institutional context. As a result, the findings should be interpreted as illustrative rather than generalisable across all educational systems. Second, the WISDT framework proposed in this article represents a conceptual model informed by institutional observations rather than a fully tested empirical framework. Future research may examine how the framework operates across different school systems and policy environments through comparative or longitudinal studies. Such research would help further validate the relationships between digital governance, sustainability practices, and institutional resilience in education.

Although the WISDT framework offers a conceptual perspective on integrating sustainability and digital transformation in schools, further research is needed to examine how such approaches operate across different educational contexts. Comparative studies across national and international school systems could provide valuable insights into how governance structures, policy environments, and institutional cultures influence the integration of sustainability and digital innovation. Longitudinal research examining how sustainability indicators, digital governance systems, and organisational well-

being evolve over time would also help clarify the conditions under which schools develop long-term institutional resilience.

Additional Declaration

Author Contributions

In this study, the entire contribution solely belongs to the author

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Responsible Artificial Intelligence Statement

In this study, artificial intelligence tool ChatGPT was used in language editing. The artificial intelligence tool was used to correct language errors, to check the data analysis made by the author. I declare that we, as the authors, take full responsibility for the problems that may arise from the content produced by artificial intelligence.

Conflicts of Interest

The author declares that there are no conflicts of interest related to the publication of this study.

Ethics Approval

In all processes of this study, the principles of Pen Academic Publishing Research Ethics Policy were followed. This study does not require ethics committee approval as it does not involve any direct application on human or animal subjects.

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