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Digitalization of the Educational Process and Its Implications on Quality Management in Pre-university Education

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Abstract
This article examines the impact of digitalization on the quality management system in Romanian pre-university education, within the framework of the SMART.Edu 2021–2027 Strategy and the alignment with European policies such as the Digital Education Action Plan (2021–2027). The analysis is based on a review of educational policies, international frameworks (OECD, UNESCO, EU), and institutional platforms (SIIIR, Edusal, ARACIP Online). Findings reveal that digitalization contributes to evidence-based decision-making, transparency, and stakeholder engagement, while challenges persist in terms of digital inequalities, teacher preparedness, and data security. Conclusions emphasize that digitalization is not merely a technological development but a multidimensional cultural and organizational transformation, fundamental for a sustainable and equitable quality management system in education.

Keywords: educational digitalization; quality management; SMART.Edu; SIIIR; Edusal; ARACIP; Dig Comp Edu; pre-university education.

Introduction

The digital transformation of education is one of the central priorities on the European Union agenda. The *Digital Education Action Plan (2021–2027)* sets clear objectives for building high-performing digital education ecosystems and enhancing digital skills across member states. In Romania, these goals are reflected in the *SMART.Edu Strategy (2021–2027)*, which envisions a fully digitalized education system supported by modern infrastructure, digitally competent teachers, and transparent governance tools. The COVID-19 pandemic accelerated this transformation, exposing structural vulnerabilities—particularly in rural areas—but also highlighting opportunities to reform how educational quality is managed. Whereas traditional quality assurance relied heavily on bureaucratic procedures and retrospective evaluations, digitalization opens the path toward proactive, data-driven, and participatory governance models. This article explores the implications of digitalization for the quality management system in Romanian pre-university education, addressing three key research questions:

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1. How do digital platforms (SIIIR, Edusal, ARACIP Online) contribute to quality management processes?
2. What are the benefits and challenges of integrating digital tools in assessment, monitoring, and decision-making?
3. To what extent can digitalization support the development of a reflective and participatory culture of quality?

Theoretical Framework

Quality management in education has long been associated with frameworks such as Total Quality Management (TQM), the European Foundation for Quality Management (EFQM) model, and more recently ISO 21001, the international standard for educational organizations. These approaches emphasize continuous improvement, evidence-based decision-making, and stakeholder engagement.

In the context of digitalization, these principles acquire new relevance. Information systems enable real-time monitoring of performance indicators, predictive analytics, and collaborative platforms that bring together teachers, students, and parents in shared decision-making. Digitalization thus acts as an enabler of *transformational leadership*, where school managers shift from compliance-based approaches to anticipatory governance.

The European *DigCompEdu* framework further defines teachers' digital competences in six dimensions: professional engagement, digital resources, teaching and learning, assessment, empowering learners, and professional development. Integrating this framework into national training policies is essential for ensuring that digital tools are effectively harnessed in support of quality education.

Methodology

This article adopts a qualitative approach based on **document analysis and policy review**. The following sources form the basis of the analysis:

- National and European policy documents (*SMART.Edu Strategy*, *Digital Education Action Plan 2021–2027*).
- Reports from OECD and UNESCO concerning digitalization and quality assurance.
- Secondary data from institutional platforms (SIIIR, Edusal, ARACIP Online).
- Empirical studies on teachers' digital competences in Romania and comparative perspectives from other EU countries.

This methodology provides a broad understanding of how digitalization shapes quality management in pre-university education, while acknowledging the systemic challenges faced in implementation.

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Findings / Results

1. Digital Infrastructure for Quality Management

Romania's digital educational infrastructure is anchored in three major platforms:

- **SIIIR (Integrated Educational Information System):** provides unique identifiers for students, integrates data on attendance, academic results, and human resources, and generates standardized reports on key indicators such as absenteeism and dropout rates.
- **Edusal:** aggregates demographic, financial, and curricular data, supporting equity and efficiency monitoring at both local and national levels.
- **ARACIP Online:** facilitates external evaluations, institutional self-assessment, and monitoring of improvement plans, strengthening accountability and transparency.

Together, these platforms support evidence-based governance and align Romania with international standards. However, OECD (2024) notes that SIIIR remains underdeveloped compared to EU counterparts, due to weak interoperability and limited use in predictive analysis.

2. Digitalization of Assessment and Feedback

Digital tools reshape evaluation by enabling:

- **Standardized online testing** with immediate feedback.
- **Adaptive microlearning** that adjusts content difficulty based on learners' responses.
- **Interactive feedback models**, where students receive tailored suggestions step by step.

Such tools promote *formative assessment*, enhance student engagement, and support metacognitive development. For teachers, digital platforms (Classtime, Kahoot, Edpuzzle) offer insights into learning progress and facilitate instructional adaptation.

3. Teachers' Digital Competencies

Although over half of Romanian teachers report feeling "comfortable" with technology, empirical evidence (Cristea et al., 2022; Hatos, Cosma & Clipa, 2022) indicates modest digital skills compared to European peers. Professional development programs remain fragmented, with only 4% of training courses between 2013–2018 addressing digital competences. The lack of systematic DigCompEdu integration and the perception of digital risks (e.g., data security, workload increase) negatively impact teachers' motivation to adopt technology.

4. Institutional and Social Challenges

Digitalization is hampered by systemic barriers:

- **Digital divide:** rural schools face poor connectivity, insufficient devices, and reduced expertise.
- **Cultural resistance:** teachers and managers may resist digital change due to anxiety and attachment to routines.
- **Data protection gaps:** absence of coherent school-level policies creates vulnerabilities and discourages technology adoption.

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Discussion

The results show that digitalization has transformative potential but requires favorable systemic conditions. Platforms such as SIIIR and ARACIP Online create opportunities for transparency and proactive governance, yet their effectiveness is undermined by infrastructural inequalities and limited digital competences.

Comparatively, countries like Estonia and Finland demonstrate how fully interoperable data systems and national teacher training programs can embed digitalization within quality assurance. Romania, by contrast, remains at an intermediate stage: it has a solid regulatory framework but faces uneven implementation.

Encouragingly, innovations such as the *Early Warning Mechanism (EWM)* within SIIIR showcase how predictive analytics can prevent dropout and support targeted interventions. Nevertheless, without investments in teacher training and robust cybersecurity policies, the benefits of digitalization may remain underexploited.

Conclusions and Recommendations

1. **Digitalization is essential** for modernizing quality management, enabling transparency, accountability, and evidence-based decisions.
2. **Institutional platforms (SIIIR, Edusal, ARACIP Online)** provide a data-centric ecosystem, but their efficiency depends on interoperability, user competence, and sustainable investment.
3. **Digital assessment tools** foster formative evaluation and student self-regulation but require systematic teacher training based on DigCompEdu.
4. **Bridging the digital divide** between rural and urban schools is crucial to ensuring equity and avoiding marginalization.
5. **Policies on data protection and cybersecurity** must be strengthened to safeguard sensitive educational data.
6. **Digitalization must be seen as a cultural and organizational shift,** not just technological innovation. Leadership development, collaborative practices, and participatory governance are essential for sustainability.

Future research should explore long-term impacts of digital platforms on student outcomes, parental engagement in digital governance, and comparative lessons from other EU countries.

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