

Rethinking EdTech: A Multi-Criteria Comparative Analysis of EdTech Platforms

Oana-Larisa STOICA, Andrei-Cătălin NICA
Bucharest University of Economic Studies, Romania
oanalarisa.stoica@csie.ase.ro, nicacatalin19@stud.ase.ro

The rapid evolution of artificial intelligence (AI) is transforming Educational Technology (EdTech), enabling new forms of personalized learning, real-time feedback and adaptive instruction. Despite this potential, the ways in which AI is integrated into learning platforms vary significantly, affecting their effectiveness, usability and transparency. This research investigates these differences through a multi-criteria evaluation of AI-driven EdTech platforms, with a comparative focus on Romanian and international solutions. Six categories of platforms are examined, using a mixed-methods approach that combines qualitative functional analysis, semi-quantitative scoring and comparative assessment. A multi-criteria decision analysis (MCDA) model is applied, evaluating five dimensions: AI functionalities, personalization, feedback quality, user experience and transparency. The results show that platforms with advanced AI integration, such as adaptive learning and intelligent tutoring systems, achieve higher levels of personalization and feedback quality but often at the expense of transparency. This study offers a novel evaluation framework, a functional taxonomy of AI in EdTech and an evidence-based comparison, providing valuable insights for educators, developers and policymakers aiming to advance AI-enhanced learning environments.

Keywords: Educational Technology Platform, Artificial Intelligence, Learning, Adaptivity, Personalization

DOI: 10.24818/issn14531305/30.3.2026.05

1 Introduction

Education stands among the primary domains profoundly shaped by major technological transformations, a reality that is becoming ever more apparent. In this context, education is currently undergoing a profound structural transformation driven by digitalization, the expansion of data-driven systems and the accelerated integration of Artificial Intelligence (AI) into educational ecosystems. Educational Technology (EdTech) is increasingly recognized as a continuously evolving field that reshapes how knowledge is delivered, accessed and evaluated at a global scale [1].

Modern EdTech is defined by the use of digital platforms, adaptive systems and data-driven tools that enable the personalization of learning processes. The integration of Artificial Intelligence supports the development of adaptive learning environments, automated assessment systems and advanced feedback mechanisms for learners [2]. At a global level, research

highlights that the adoption of EdTech is strongly influenced by disparities between developed and developing countries, particularly in terms of digital infrastructure and access to technology [3]. From a conceptual perspective, EdTech is understood as a complex ecosystem that integrates digital infrastructure, software platforms and data analytics systems. This evolution is closely linked to the Education 4.0 paradigm, which promotes flexible, competency-based and learner-centered education models [4] [5].

Furthermore, the development of EdTech is strongly associated with the use of digital analytics, which enables performance monitoring, learning optimization and data-driven decision-making in educational environments. This contributes to the transition toward more sustainable and efficient educational systems [6].

Studies also show that the evolution of EdTech brings both significant benefits, such as increased accessibility and improved educational efficiency, as well as major

challenges, including inequality of access, infrastructural limitations and insufficient digital competencies among users [7]. At the market level, the European EdTech sector is experiencing rapid growth, driven by the digitalization of education, public investment and increasing demand for lifelong learning and digital skills. In 2024, the market was valued at approximately USD 41–44 billion, with projections indicating a rise to nearly USD 90 billion by 2035, reflecting a compound annual growth rate of around 7% [8]. This expansion contributes to the consolidation of a global, technology-driven educational ecosystem.

Despite the continuous growth and widespread adoption of digital education platforms, research that critically examines these platforms remains surprisingly limited [9]. The selection of an IT solution has a significant impact on both the structure of the educational environment and the learning models implemented in the teaching process. In this context, examining online platforms based on their functional role has become increasingly necessary, considering the growing diversity and complexity of available digital solutions. This situation highlights the increasing need for rigorous and efficient methods for evaluating educational platforms [10].

This study investigates and compares EdTech platforms that integrate AI, with a focus on strategies for learner adaptivity, automated feedback mechanisms and technological maturity. The analysis encompasses both Romanian and international platforms, aiming to highlight differences, identify possible strategic gaps and propose innovative directions for optimization. To guide the investigation and address the study's objectives, three primary research questions were formulated. These questions are designed to clarify how technical characteristics and system design influence learning experiences and platform competitiveness on a global scale:

RQ1: How does the complexity of AI architecture affect data transparency and governance?

RQ2: To what extent does system design, through feedback mechanisms, shape the learner's interaction with AI and the risk of cognitive dependency?

RQ3: What is the strategic gap between local (Romanian) platforms and global leaders in AI adoption?

By formulating these questions, the study aims not only to evaluate existing platforms but also to provide a deeper understanding of how AI can be effectively integrated to support more adaptive and transparent learning experiences.

The structure of this paper is designed to provide a comprehensive and methodologically rigorous analysis of contemporary EdTech platforms. The opening sections establish the research context, motivation and identified research gaps; while also synthesizing the existing literature and delineating the core conceptual dimensions of the study, including EdTech, AI and the typologies of digital learning platforms. The methodology section then presents a detailed account of the research design, including the systematic search strategy, dataset construction and the analysis procedures. Emphasis is placed on ensuring transparency, replicability and methodological robustness in the selection and analysis of the platforms considered. The subsequent results section reports the findings derived from the comparative analysis, highlighting key patterns related to the degree and form of AI integration across different EdTech platforms. Building on these findings, the discussion section interprets the results in relation to the existing body of literature, highlighting both theoretical implications and practical relevance for the design and evaluation of intelligent educational systems. Finally, the concluding section summarizes the main contributions of the study, outlines its limitations and proposes directions for future research.

2 Literature Review

Across the academic literature on artificial intelligence in education, a marked and accelerating interest can be observed in the

integration of intelligent technologies into teaching, learning and assessment, a trend mirrored by their growing prevalence in everyday life. In the current reports of the Organisation for Economic Co-operation and Development (OECD), it is surprising that technological evolution is not the only benefit due to the integration of AI and that this is a structural transformation of educational ecosystems that influences several aspects [11]. The most significant of these aspects are: the personalization of learning, the development of digital skills and the role of the teacher in the educational process. Artificial Intelligence is increasingly associated with automated feedback, the analysis of educational data and with mechanisms for adapting content, but the efficiency is influenced by the pedagogical and institutional context [12].

The evolution of EdTech has been gradual and closely linked to advances in computing and digital infrastructure. More recently, particularly in the post-pandemic context, EdTech has evolved into a data-driven ecosystem increasingly enhanced by artificial intelligence, adaptive learning technologies and advanced analytics. Digital teaching platforms (DTP), a subcategory of EdTech, mark the transition from a standardized educational model to an adaptive one, in which learning is personalized through continuous monitoring of student progress and the adjustment of content according to individual needs [13].

Despite the rapid growth of AI in education, the literature reveals several important limitations that this study addresses. First, there is a lack of standardized comparative frameworks, as existing studies often evaluate educational platforms in isolation or based on inconsistent criteria, which makes cross-platform comparison difficult and non-replicable [14]. In addition, there is a lack of a widely accepted multidimensional framework that enables systematic evaluation across different categories of EdTech platforms, highlighting the need for structured multi-criteria approaches in this field and further research to support the development of the

next generation of e-learning systems [15].

Second, most research does not sufficiently differentiate between types of AI used in educational systems, treating AI as a single concept rather than distinguishing between Adaptive AI, Generative AI, Rule-Based Tutoring Systems or Analytics-Driven Recommendation Engines [16]. This limits the understanding of how different AI architectures influence pedagogical outcomes.

Third, comparative analysis between Romanian and international platforms remains limited, as Romanian educational solutions are underrepresented in global studies. This results in a lack of systematic evaluation that positions local platforms within the broader maturity landscape of AI in education [17]. Finally, many existing studies lack empirical validation aligned with international benchmarks such as OECD frameworks, being primarily conceptual or descriptive and not fully connected to standardized indicators of digital education maturity, learning analytics or AI readiness [13].

Other recent studies highlight that the integration of Artificial Intelligence in education is greatly influenced by institutional and political factors, which extend beyond technological considerations. Research on the digital transformation in education shows that governance structures, teacher training and the existence of coherent national or institutional strategies are the ones that influence the successful adoption of AI-based platforms [16]. Given this context, countries that have implemented structured policies in the field of digital education tend to achieve a much more efficient and scalable integration of Artificial Intelligence technologies in teaching and learning processes [17].

Another important dimension identified in the existing literature is the rapid expansion of the Artificial Intelligence market in education, which has led to an increased diversity of educational platforms and technological solutions. Market analyses show a significant increase in investment and innovation, driven by the demand for customizable and scalable

learning environments [18]. This expansion contributes to the emergence of new emerging platforms with different levels of technological maturity, leading to more complex systematic comparisons and reinforcing the need for standardized assessment frameworks [19].

New paradigms in educational interaction have emerged with the rise of GenAI [20]. Conversational learning, real-time feedback generation, and dynamic content creation are supported by GenAI, unlike traditional adaptive systems [21]. All of these capabilities improve student engagement and support exploratory learning approaches, but at the same time they also raise challenges related to accuracy, reliability and pedagogical alignment. Recent research highlights the importance of distinguishing between increased engagement and actual learning effectiveness when evaluating educational systems based on AI [22].

A concept increasingly recognized in the field of AI as a critical component of modern educational systems is that of literacy. Current frameworks specify that students should develop an understanding of the principles, limits and ethical implications that underlie them, as simply interacting with Artificial Intelligence tools is not enough. The shift is to be able to transform AI from a supporting technology to an educational objective in itself, requiring new approaches to curriculum design, assessment and platform evaluation [23].

Therefore, ethical and governance considerations become central when analyzing AI in education. Data privacy, fairness in automated decision-making, algorithmic transparency and potential biases that may arise in AI systems are issues that are gaining increasing attention in both academic and policy-oriented research [24]. All of these factors influence user trust, adoption networks and the long-term sustainability of educational technologies and therefore need to be considered essential components in any comprehensive evaluation framework [25].

To address these gaps, the present study makes several key contributions. It proposes a

Multidimensional Evaluation Model based on Multi-Criteria Decision Analysis (MCDA), designed to assess educational platforms across multiple dimensions, including personalization, feedback quality, usability, adaptability and AI integration. This framework enables consistent and comparable evaluation across heterogeneous categories of EdTech platforms and can be applied both in academic research and practical assessment contexts [26].

Furthermore, the study introduces a classification framework for AI types in educational platforms. This taxonomy provides a more detailed understanding of how artificial intelligence is embedded in educational technologies and how it supports different learning processes [27]. In addition, the research provides a comparative analysis between Romanian and international platforms, revealing a clear maturity gap in AI integration. International platforms demonstrate more advanced capabilities in personalization, adaptive learning and feedback mechanisms; while Romanian platforms tend to use AI primarily as a supporting feature, indicating an ongoing transition in digital education maturity [28].

Overall, the study reframes the evaluation of educational platforms by shifting the focus from performance ranking to paradigm-based analysis, emphasizing that technological value in education is not absolute, but context-dependent and pedagogically driven [29].

3 Methodology

The evaluation of educational platforms cannot be based on a single indicator, but requires a multidimensional analysis of the factors influencing their performance. Accordingly, numerous studies have developed evaluation frameworks based on hierarchically structured criteria weighted according to their relative importance [14],[25],[30],[31],[32],[33],[34] in order to more accurately capture the complexity of digital learning systems.

In line with the DeLone and McLean information systems success model, platform success is conceptualized as a

multidimensional construct in which technological performance, information quality and user experience jointly determine overall effectiveness [30],[35].

This perspective is further supported by empirical findings in the literature, which highlight that technological factors (such as system reliability, ease of use, accessibility and infrastructure quality) play a decisive role in shaping e-learning adoption and usage, alongside user-related and organizational dimensions [36]. The model emphasizes that the success of E-Learning platforms emerges from the interaction between system quality, content quality, usage, user satisfaction and net benefits, rather than from isolated factors.

From this perspective, this study applies a Multi-Criteria Decision Analysis (MCDA) framework to assess platform performance. It constitutes a robust and flexible method for the comparative evaluation of educational technologies, providing a structured decision-support framework for both users and developers. This approach enables an objective, coherent and comparable analysis of platform performance by integrating multiple relevant criteria into a unified evaluation model [37], consistent with prior research that applies multi-criteria approaches for the assessment and ranking of EdTech tools. In addition, this method is often complemented by fuzzy logic methods [38], which allow the handling of uncertainty and subjectivity in expert evaluations, particularly in contexts where qualitative judgments must be transformed into quantitative scores [39]. Hence, this study adopts a mixed-methods approach, combining qualitative, semi-quantitative and comparative analyses to provide a comprehensive assessment of AI-driven EdTech platforms:

- Qualitative analysis focuses on functional and conceptual aspects of each platform, examining AI implementation, learner adaptivity and feedback mechanisms.
- Semi-quantitative evaluation applies an expert-based scoring model across five dimensions: AI functionalities, learner adaptivity, feedback quality, user experience (UX) and transparency. Scores

range from 1 (very low) to 5 (very high) and are weighted to reflect their relative importance. To further enhance robustness and reduce subjectivity, fuzzy logic principles can be conceptually integrated into the evaluation process, allowing linguistic expert judgments to be interpreted more consistently and reflecting uncertainty in qualitative assessments.

- Basic comparative analysis benchmarks platforms against each other, highlighting differences between Romanian and international solutions and identifying strategic gaps in AI adoption.

3.1 Sample and Data Collection

The study adopted a structured expert-based comparative design. Data collection involved six IT professionals with experience in the application of artificial intelligence in education, software development and digital learning systems. Each expert created individual accounts on the selected EdTech platforms and conducted standardized hands-on evaluations under predefined usage scenarios to ensure consistency across assessments.

The analysis covers seventeen EdTech platforms, including five Romanian (Brio, Adservio, LIVRESQ, Aula, NEXTLAB) and twelve international solutions (DreamBox, Century Tech, Squirrel AI, Khan Academy, MATHia, ALEKS, Pearson, Google Classroom, Articulate, Canva, Code.org, Tynker). International platforms were selected based on comparability in terms of target audience, digital-native architecture and integration of real-time AI adaptivity, ensuring meaningful benchmarking between local and global implementations.

The evaluation was based on a weighted scoring framework, where each criterion was assessed individually and assigned a predefined weight according to its relative importance in determining overall platform performance. The criteria included system usability, AI-driven personalization capabilities, responsiveness, content relevance and overall user experience,

structured within the following five dimensions. Weighted scores were aggregated to compute a composite performance index for each platform. To enhance robustness and reduce subjectivity, findings were also triangulated with official platform documentation, peer-reviewed literature and OECD reports [11],[40],[41],[42],[43],[44],[45] on AI in education.

3.2 Evaluation Framework Description

Building on this theoretical foundation, the evaluation criteria were operationalized into measurable dimensions reflecting both system-level characteristics and user-centered outcomes. Accordingly, the evaluation grid includes five dimensions, weighted to reflect their relative importance:

Table 1. Evaluation Dimensions and Associated Weights

Code	Dimension	Weight
D1	AI Functionalities	20%
D2	Learner Adaptivity	25%
D3	Feedback Quality	20%
D4	User Experience (UX)	15%
D5	Transparency	20%

Based on the findings, higher weights were assigned to core AI-related functionalities and learner adaptivity, as these dimensions are considered most critical for capturing the intelligence and personalization capabilities of the platforms. The remaining criteria were allocated to complementary aspects such as feedback quality, user experience (UX) and transparency, ensuring a balanced and comprehensive evaluation framework. The results further indicate that system quality and user experience significantly shape the overall perception of platform performance, while technical and functional dimensions play a decisive role in determining the overall effectiveness and efficiency of the system. Each dimension is scored on a scale from 1 (very low) to 5 (very high). The final score is computed using a weighted aggregation approach, which ensures a balanced assessment of platform performance across

multiple criteria, allowing each dimension to contribute proportionally to the overall evaluation according to its relative importance:

Final Score=

$$\sum_{i=1}^5 Score(D_i) \times Weight(D_i)$$

where $Score_{D_i}$ represents the score assigned to dimension D_i , and $Weight_{D_i}$ represents the weight associated with that dimension. The model is designed to be platform-independent, emphasizing functional capabilities rather than underlying AI architectures.

4 Results

The analysis reveals that platforms differ significantly depending on their pedagogical objective. In the following sections, the seventeen platforms are classified into six typologies derived from the literature and their evaluation is conducted based on five analytical dimensions. Adaptive learning and tutoring systems show the highest AI integration, while LMS and content creation tools rely less on AI. Romanian platforms tend to use AI as a supporting feature rather than a core component. International platforms demonstrate higher maturity, especially in personalization and feedback mechanisms.

4.1 Adaptive Learning Platforms

A first major observation is that adaptive learning platforms demonstrate the highest degree of AI integration and pedagogical sophistication. These systems are designed to continuously adapt to learner behavior, performance patterns and knowledge gaps.

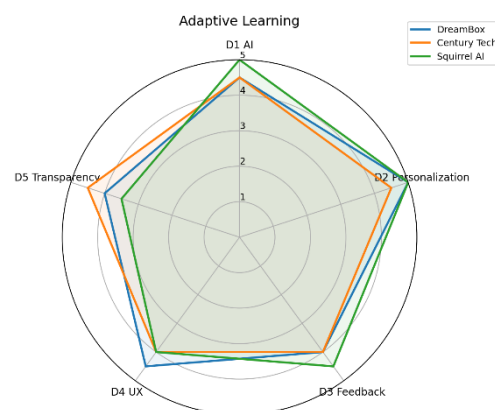


Fig. 1. Performance Comparison of Adaptive Learning Platforms

As shown in Fig. 1, they consistently achieve higher scores in dimensions such as personalization (D1), feedback quality (D2) and learning adaptability (D3). Platforms such as DreamBox, Century Tech and Squirrel AI illustrate this trend, where AI is not an auxiliary feature but a core architectural component of the system. The relatively balanced distribution of scores across dimensions also suggests a mature and stable implementation of adaptive algorithms.

4.2. Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITS) show strong overall performance, with Khan Academy outperforming MATHia in most evaluation dimensions, particularly in personalization and learning effectiveness. Both platforms demonstrate high scores in feedback quality, which appears to be the strongest and most consistent dimension across ITS solutions.

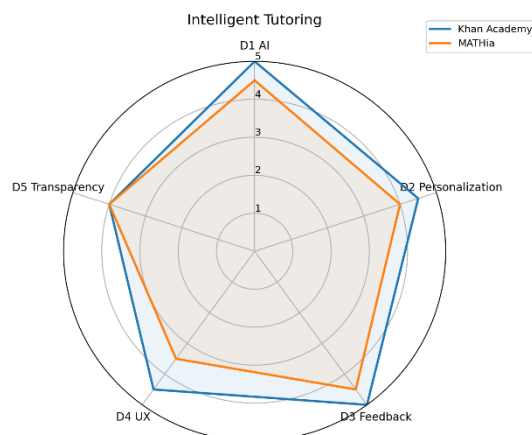


Fig. 2. Comparison of Intelligent Tutoring Systems

A key observation (Fig. 2) is that feedback represents the strongest dimension across ITS platforms, highlighting their effectiveness in providing immediate and targeted instructional support. Additionally, Generative AI technologies are increasingly enabling more natural and conversational interaction, whereas traditional ITS models remain more structured and rule-based in their learning pathways.

4.3. Assessment Platforms

In contrast, assessment platforms show a more heterogeneous profile, where AI is primarily

used for evaluation and feedback rather than deep personalization. While platforms like ALEKS and Pearson demonstrate relatively strong performance, particularly in structured feedback mechanisms, others such as Brio reflect lower levels of technological sophistication and limited adaptive capabilities (Fig. 3).

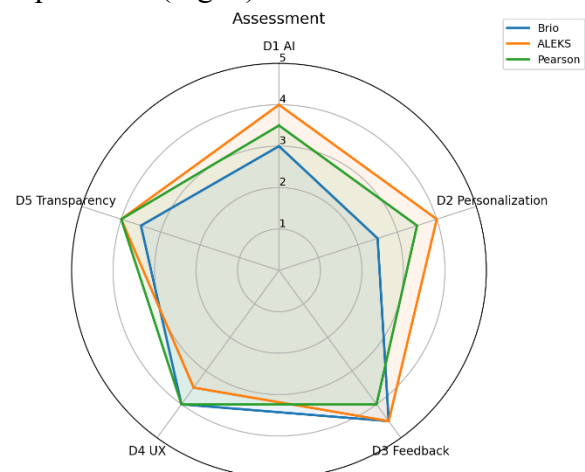


Fig. 3. Multifaceted Evaluation of Assessment Platforms

This indicates that assessment systems are still in a transitional phase, evolving from traditional testing models toward more intelligent, data-driven evaluation frameworks.

4.4. LMS / Management Platforms

A similar pattern to that observed in Assessment Platforms can also be identified in Learning Management Systems (LMS), where the primary focus remains on usability, content organization and administrative support rather than AI-driven learning enhancement.

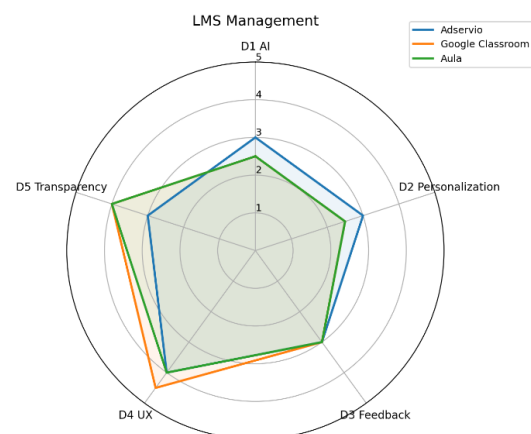


Fig. 4. In-Depth Multidimensional Analysis of LMS platforms

Platforms such as *Google Classroom*, *Adservio*, and *Aula* exhibit strong usability and accessibility scores (D4 and D5) as shown in Fig. 4, but comparatively low AI integration across personalization and adaptive learning dimensions.

This confirms that LMS platforms function predominantly as infrastructural tools rather than intelligent learning systems.

4.5. Content Creation Platforms

Content creation platforms represent another distinct category, characterized by a strong emphasis on user experience and design flexibility rather than pedagogical intelligence. Tools such as *Canva*, *Articulate* and *LIVRESQ* are primarily focused on enabling educators to produce digital learning materials efficiently.

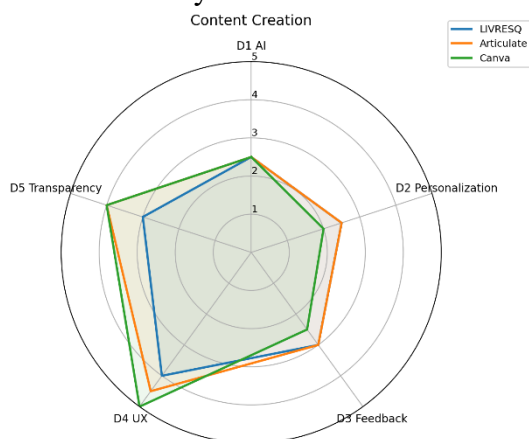


Fig. 5. Holistic Evaluation of Content Creation Platforms

Fig. 5 highlights that AI functionalities in this category are still emerging and are generally limited to content assistance or automation features, rather than adaptive educational decision-making.

4.6. STEM / Experiential Platforms

Finally, STEM and experiential learning platforms occupy an intermediate position, combining elements of engagement, interactivity and partial personalization. Platforms like *Code.org*, *Tynker* and *NEXTLAB* demonstrate moderate AI

integration, often embedded in gamified learning environments or guided problem-solving activities. However, their AI capabilities remain context-specific rather than fully adaptive.

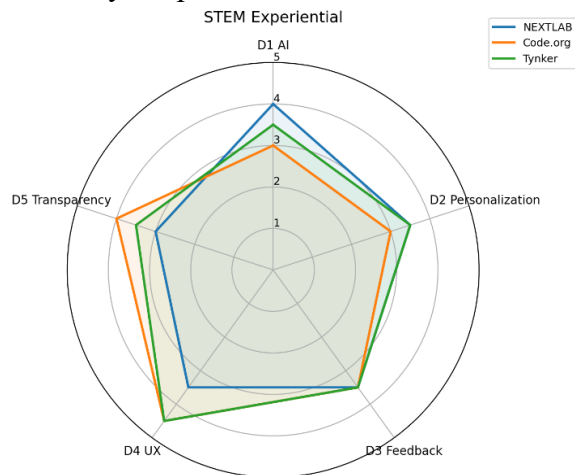


Fig. 6. Multi-Dimensional Evaluation of STEM platforms

A cross-category comparison reveals a broader pattern: AI maturity is strongly correlated with pedagogical intent. Platforms designed for individualized learning (adaptive systems and ITS) naturally integrate more advanced AI techniques, while infrastructural or content-focused platforms (LMS and content creation tools) prioritize usability and scalability over intelligence. Platforms with higher scores in AI functionalities and learner adaptivity tend to align with higher levels of the proposed AI maturity model.

Another important finding is the regional disparity between Romanian and international platforms. Romanian solutions tend to implement AI as a supporting feature rather than a central component of the learning architecture. In contrast, international platforms demonstrate a higher level of maturity in AI-driven personalization, continuous feedback loops and learner modeling. This suggests not only a technological gap but also differences in design philosophy and investment in educational AI research.

Overall, the results indicate a clear stratification of educational technologies, where AI integration varies significantly across categories, reflecting both pedagogical objectives and ecosystem maturity. This

multidimensional evaluation framework highlights the transition from traditional digital learning environments toward more intelligent, adaptive educational systems.

5 Discussions

This study aims to compare AI integration strategies in EdTech platforms, with a focus on identifying architectural patterns, performance trade-offs and strategic gaps between Romanian and international solutions. Using a multi-criteria evaluation framework, the research provides a structured assessment of how varying levels of AI integration influence learner adaptivity, feedback mechanisms, transparency and overall platform performance. Based on the empirical findings, the following responses to the initial research questions (RQs) are advanced:

Answer to RQ1: How does the complexity of AI architecture influence transparency and governance?

The findings reveal a structural trade-off between algorithmic sophistication (D1) and system transparency (D5). Platforms built on advanced AI architectures, such as Intelligent Tutoring Systems (ITS) and large-scale neural networks (e.g., Squirrel AI, DreamBox), enable high levels of adaptive intelligence but tend to operate as opaque “black-box” systems, limiting explainability. In contrast, LMS and content creation platforms (e.g., Google Classroom, Canva) maintain higher transparency by restricting AI to assistive roles and preserving user control over data. This suggests that AI innovation currently outpaces the development of explainability and governance frameworks.

Answer to RQ2: How does system design, particularly feedback mechanisms, shape the learner–AI relationship and the risk of cognitive dependency?

The results highlight a shift toward dialogue-driven feedback models. Platforms integrating Generative AI (e.g., Khanmigo) use large language models (LLMs) to provide guided questioning rather than direct answers, supporting active learning processes. This design redefines AI as a cognitive partner

rather than a solution provider, fostering engagement while reducing the risk of dependency.

However, some findings suggest that these benefits are highly dependent on pedagogical design. While GenAI can improve performance in immediate tasks, this does not always translate into durable learning when AI support is removed, indicating potential risks of externalized cognition, reduced metacognitive effort and “false mastery”; where perceived understanding exceeds actual competence [45].

Answer to RQ3: What is the strategic gap between local (Romanian) platforms and global leaders in AI adoption?

The comparative analysis indicates a fundamental difference in how AI is positioned within platform architectures. Global leaders (e.g., DreamBox, Khanmigo) adopt an AI-centric approach, where artificial intelligence acts as the core engine enabling dynamic, data-driven learning pathways. In contrast, Romanian platforms primarily integrate AI as an auxiliary layer within traditional LMS or content authoring systems (e.g., Adservio, LIVRESQ). While this approach supports usability and gradual adoption, it limits the development of fully adaptive learning environments, highlighting a significant strategic gap.

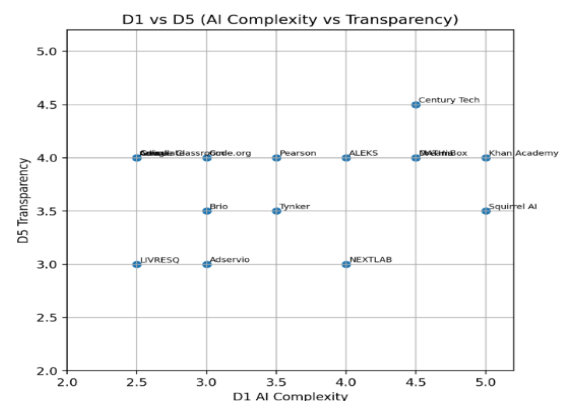


Fig. 7. Relationship between AI complexity (D1) and transparency (D5)

The figure 7 above highlights an inverse relationship between AI complexity (D1) and the level of transparency (D5), confirming the existence of a structural trade-off between performance and explainability. Platforms

with high D1 scores (such as DreamBox, Squirrel AI and Khan Academy) tend to exhibit lower levels of transparency, suggesting the use of complex “black-box” models. In contrast, platforms with lower levels of AI integration (such as Google Classroom and Canva), demonstrate higher

transparency scores, due to greater user control over decision-making processes. These findings support concerns raised by the OECD regarding the limited transparency of AI-based systems and emphasize the need for the development of explainable AI (XAI) mechanisms.

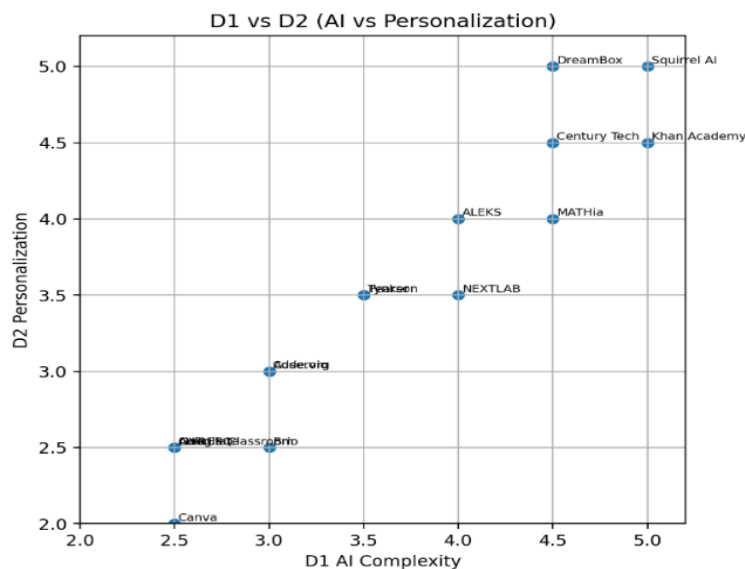


Fig. 8. Relationship between AI complexity (D1) and personalization (D2)

The figure below illustrates the relationship between AI complexity (D1) and the level of learner adaptivity (D2), revealing a strong positive correlation. In this context, platforms with a high degree of AI integration demonstrate advanced adaptive capabilities, dynamically adjusting both content and learning pathways in real time.

Tech), which achieve top scores across both dimensions.

Conversely, platforms with limited AI integration exhibit lower levels of adaptivity, reinforcing the central role of AI technologies in enabling truly adaptive and data-driven educational systems.

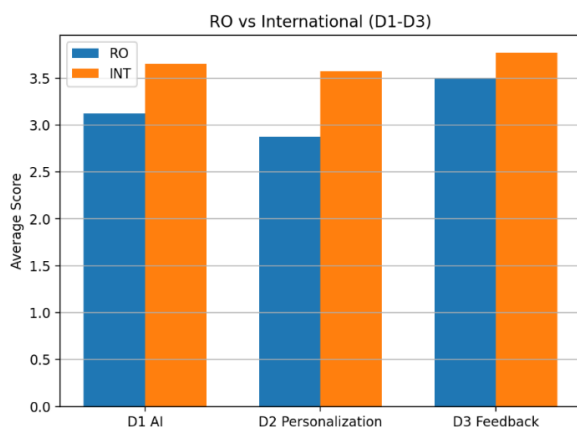


Fig. 9. Comparison between Romanian and international platforms (D1–D3)

This pattern is particularly evident in adaptive learning platforms (e.g., DreamBox, Century



Fig. 10. Heatmap of platform scores across evaluation dimensions

Subsequently, a comparison of the average scores between Romanian and international platforms was conducted. As illustrated in the figure no. 9 above, the results reveal a clear gap in terms of AI integration (D1), learner adaptivity (D2) and feedback quality (D3). International platforms consistently achieve significantly higher scores, reflecting greater technological maturity and a deeper integration of AI into educational processes. In contrast, Romanian platforms, while performing well in terms of user experience and functional integration, tend to incorporate AI primarily as a supporting feature rather than a core component. These findings confirm the existence of a strategic gap in AI adoption and highlight important opportunities for development, particularly in advancing data-driven adaptive learning capabilities.

The heatmap from figure 10 provides a comprehensive overview of score distribution across all evaluated dimensions, revealing distinct patterns across different categories of EdTech platforms. Adaptive learning systems and intelligent tutoring platforms consistently achieve high scores across dimensions D1–D3 (AI functionalities, learner adaptivity and feedback quality), highlighting the central role of AI in shaping their core functionality and learning processes. These platforms leverage advanced AI architectures to deliver dynamic, data-driven learning experiences and personalized feedback loops.

In contrast, LMS and content creation platforms tend to score higher on user experience (D4), reflecting their focus on usability, accessibility and interface design. However, they exhibit lower performance on AI-related dimensions, indicating a more limited or auxiliary use of artificial intelligence, primarily in support rather than as a core driver of the system.

Overall, these patterns reinforce the proposed classification of EdTech platforms and demonstrate that pedagogical objectives and platform design priorities directly influence both the level and the role of AI integration. This finding highlights the existence of differentiated development strategies within

the EdTech ecosystem, ranging from AI-centric architectures to UX-driven platforms with limited AI involvement.

6 Conclusions

The findings of this study suggest that educational platforms should not be interpreted through a simplistic performance hierarchy based on better or less advanced systems. Instead, they should be understood as belonging to fundamentally different pedagogical and technological paradigms. Each category of platform is designed with distinct instructional objectives, which directly influence both the depth and type of AI integration.

In this context, a key insight emerging from the analysis is that there is a direct correlation between the pedagogical role of a platform and the nature of AI technologies it employs. Platforms focused on adaptive learning and individualized instruction tend to integrate advanced AI techniques such as learner modeling, predictive analytics and dynamic content adaptation. Conversely, Learning Management Systems (LMS) and content creation tools primarily rely on AI for supportive or auxiliary functions (such as: automation, recommendation or content assistance), rather than deep personalization or autonomous decision-making. This distinction highlights the fact that AI adoption in education is not uniform, but structurally dependent on instructional purpose.

Future research could extend this study by validating the proposed multidimensional evaluation framework on a larger and more diverse set of educational platforms, including emerging and region-specific EdTech solutions. Empirical validation through group testing could also be conducted to assess the model's practical applicability in real educational contexts, improving its robustness and generalizability. In addition, future work could incorporate longitudinal analysis to examine the evolution of AI capabilities over time, particularly in the context of rapidly advancing Generative AI technologies. The AI classification framework could also be refined through deeper technical distinctions,

while further alignment with international standards and policy frameworks would enhance its relevance for educational decision-making.

The evolution of EdTech reflects a deeper transformation of education itself, one that moves from standardized instruction toward personalized, lifelong learning ecosystems. Ensuring that this transformation remains human-centered, ethically grounded and pedagogically sound represents one of the defining challenges of contemporary education.

References

- [1] M. Weller, "Twenty years of edtech," *EDUCAUSE Review*, 2018. [Online]. Available: <https://er.educause.edu/articles/2018/7/twenty-years-of-edtech>
- [2] A. Srivastava and P. Verma, "Education 4.0 using AI with reference to EdTech industry," IGI Global, 2026. [Online]. Available: <https://www.igi-global.com/chapter/education-40-using-ai-with-reference-to-edtech-industry/334399>
- [3] D. Rodriguez-Segura, "EdTech in developing countries: A review of the evidence," *The World Bank Research Observer*, vol. 37, no. 2, pp. 171–203, 2022. doi: 10.1093/wbro/lkab011.
- [4] I. Shustova, E. Polevaya, and A. Ivanov, "The impact of EdTech: strengths and opportunities," *E3S Web of Conferences*, 2023. [Online]. Available: https://www.e3s-conferences.org/articles/e3sconf/abs/2023/95/e3sconf_emmft2023_06012
- [5] O.-L. Stoica, "Educational Systems in the Era of Technological Transformation – Current Challenges and Opportunities," *Informatica Economică*, vol. 30, no. 1, p. 43, 2026.
- [6] K. Sood et al., Eds., *Digital Analytics Applications for Sustainable Training and Education*. Apple Academic Press, 2024. doi: 10.1201/9781032713366.
- [7] V. V. Timchenko, S. Y. Trapitsin, and Z. V. Apevalova, "Educational technology market analysis," in *Proc. IEEE IT&QM&IS*, 2020, pp. 612–617. doi: 10.1109/ITQMIS51053.2020.9322982.
- [8] Market Data Forecast, "Europe EdTech market report," 2024. [Online]. Available: <https://www.marketdataforecast.com/market-reports/europe-edtech-market>
- [9] M. Decuypere, E. Grimaldi, and P. Landri, "Introduction: Critical studies of digital education platforms," *Critical Studies in Education*, vol. 62, no. 1, pp. 1–16, 2021. doi: 10.1080/17508487.2020.1866050.
- [10] A. Kh. Shelepaeva, "Online educational platforms: classification and criteria for assessing," *Open Education*, vol. 26, no. 3, pp. 27–34, 2022.
- [11] OECD, *Reimagining Teaching in an Accelerating World*. Paris: OECD Publishing, 2026. doi: 10.1787/d0edfe8c-en.
- [12] T. K. F. Chiu et al., "Systematic literature review on opportunities, challenges and future research recommendations of artificial intelligence in education," *Computers and Education: Artificial Intelligence*, vol. 4, 100118, 2026. doi: 10.1016/j.caeai.2022.100118.
- [13] C. Dede and J. Richards, Eds., *Digital Teaching Platforms: Customizing Classroom Learning for Each Student*. Teachers College Press, 2012.
- [14] J. Garzón, E. Patiño, and C. Marulanda, "Systematic review of artificial intelligence in education: Trends, benefits, and challenges," *Multimodal Technologies and Interaction*, vol. 9, no. 8, p. 84, 2025. doi: 10.3390/mti9080084.
- [15] M. Zare et al., "Multi-criteria decision making approach in e-learning: A systematic review," *Applied Soft Computing*, vol. 45, pp. 108–128, 2016. doi: 10.1016/j.asoc.2016.04.020.
- [16] J. Liang, J. M. Stephens, and G. T. L. Brown, "A systematic review of AI in higher education," *Frontiers in Education*, vol. 10, 2025.
- [17] N. Moroianu, S. Iacob, and A. Constantin, "Artificial intelligence in education: A systematic review," 2023.
- [18] A. Jha, "Examining the role of AI in the

- future of EdTech,” SSRN, 2024. doi: 10.2139/ssrn.4682445.
- [19] X. Wu et al., “ChatGPT’s impact on student learning outcomes,” *Humanities and Social Sciences Communications*, 2026.
- [20] Y. C. Hsu and Y. H. Ching, “Generative AI in education: The dynamic frontier,” *TechTrends*, vol. 67, pp. 603–607, 2023. doi: 10.1007/s11528-023-00863-9.
- [21] J. S. Jauhiainen and A. G. Guerra, “Generative AI and education,” *Frontiers in Education*, vol. 9, 2024.
- [22] Y. Dong, “Generative AI technologies and educational outcomes,” *Humanities and Social Sciences Communications*, 2026.
- [23] L. K. Allen and P. Kendeou, “ED-AI Lit: AI literacy framework,” *Policy Insights from the Behavioral and Brain Sciences*, vol. 11, no. 1, pp. 3–10, 2024.
- [24] S. Sangwa, P. Mutabazi, and J. B. Muvunyi, “AI-enabled framework for program design in higher education,” 2025.
- [25] W. Strielkowski et al., “AI-driven adaptive learning for sustainable educational transformation,” *Sustainable Development*, vol. 33, no. 2, pp. 1921–1947, 2025. doi: 10.1002/sd.3221.
- [26] F. X. D. Kristianingsih and R. Maharani, “Artificial intelligence in adaptive education,” *Discover Education*, vol. 4, 2025.
- [27] H. Zhu et al., “Responsible AI in education,” *Humanities and Social Sciences Communications*, 2025.
- [28] I. M. García-López and L. Trujillo-Liñán, “Ethical challenges of generative AI in education,” *Frontiers in Education*, 2025.
- [29] Y. Ofosu-Asare, “Ethical framework for generative AI in education,” *International Journal of Information and Learning Technology*, vol. 43, 2025. doi: 10.1108/IJILT-06-2024-0113.
- [30] H. F. Yousaf et al., “MCDA based framework for assessing LMS quality,” *International Journal of Politics & Social Sciences Review*, 2024.
- [31] W. H. DeLone and E. R. McLean, “The DeLone and McLean model of information systems success: A ten-year update,” *Journal of Management Information Systems*, vol. 19, no. 4, pp. 9–30, 2003. doi: 10.1080/07421222.2003.11045748.
- [32] M. A. Al-Fraihat et al., “Evaluating e-learning systems success,” *Heliyon*, vol. 6, no. 3, e03427, 2020. doi: 10.1016/j.heliyon.2020.e03427.
- [33] R. Sun et al., “What drives a successful e-learning?,” *Computers & Education*, vol. 50, no. 4, pp. 1183–1202, 2008. doi: 10.1016/j.compedu.2006.11.007.
- [34] ISO/IEC 25010:2011, *Systems and software quality requirements and evaluation*, ISO, 2011.
- [35] H. R. Winarno and N. Legowo, “E-learning success factors using DeLone and McLean model,” 2024.
- [36] S. C. Eze et al., “Factors influencing e-learning adoption,” *Humanities & Social Sciences Communications*, vol. 7, 2020. doi: 10.1057/s41599-020-00624-6.
- [37] E. Islas et al., “Multi-criteria decision making for e-learning tools,” in *Proc. CSSEDU*, 2012, pp. 309–312.
- [38] M. A. Hogo, “Fuzzy clustering for e-learning evaluation,” *Expert Systems with Applications*, vol. 37, no. 10, pp. 6891–6903, 2010. doi: 10.1016/j.eswa.2010.03.032.
- [39] M. Jaeger et al., “Fuzzy TOPSIS in e-learning evaluation,” *International Journal of Engineering Education*, vol. 39, no. 1, pp. 241–251, 2023.
- [40] OECD, *OECD Review of Digital Education Policy in the Netherlands*. OECD Reviews of School Resources. Paris, France: OECD Publishing, 2025. doi: 10.1787/91118813-en.
- [41] OECD, *Education Policy Outlook 2024: Reshaping Teaching into a Thriving Profession from ABCs to AI*. Paris, France: OECD Publishing, 2024. doi: 10.1787/dd5140e4-en.
- [42] OECD, *OECD Digital Education Outlook 2023: Towards an Effective Digital Education Ecosystem*. Paris, France: OECD Publishing, 2023. doi:

- 10.1787/c74f03de-en.
- [43] OECD and European Commission, Empowering Learners for the Age of AI: An AI Literacy Framework for Primary and Secondary Education (Review Draft). Paris, France: OECD Publishing, 2025. [Online]. Available: <https://ailiteracyframework.org>, [Accessed: Apr., 2026].
- [44] OECD, Developing an International Large-Scale AI Tool for Educational Assessment and Personalised Learning. [Online]. Available: <https://www.oecd.org/en/about/projects/developing-an-international-large-scale-ai-tool-for-educational-assessment-and-personalised-learning.html>, [Accessed: Apr., 2026].
- [45] OECD, OECD Digital Education Outlook 2026: Exploring Effective Uses of Generative AI in Education, OECD Publishing, 2026, [Online], Available: OECD Digital Education Outlook 2026 | OECD, [Accessed: Apr., 2026].



Oana-Larisa STOICA is a PhD student in Economic Informatics at the Bucharest University of Economic Studies, within the Faculty of Cybernetics, Statistics and Economic Informatics. She holds both a Bachelor's degree (2023) and a Master's degree (2025) in Economic Informatics from the same institution. Her research focuses on the intersection of education and emerging technologies, exploring how digital solutions can transform teaching, learning and assessment through personalized approaches. She works at SAP

as an IT Technology Consultant, where she is involved in the optimization of enterprise-level IT systems. Overall, her work is driven by a forward-looking vision of leveraging artificial intelligence to transform education into a more adaptive ecosystem, where technology enhances both human learning experiences and institutional decision-making.



Andrei-Cătălin NICA holds a bachelor's degree in Economics, having completed his undergraduate studies in 2022. He is currently a second-year PhD candidate in Economic Informatics within the Doctoral School of the Bucharest University of Economic Studies. Since joining the academic community, he has held teaching responsibilities across faculties of the Bucharest University of Economic Studies, delivering courses in Economic Informatics during both his first and second year of doctoral studies. Currently he is an Associate Teaching

Staff member within the Bucharest University of Economic Studies. He is the author of several journal articles and has participated in international conferences in his field. His research focuses on EdTech and the integration of Artificial Intelligence in personalized learning platforms.