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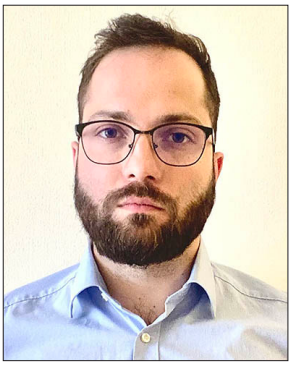

Development of an Assessment Methodology for Educational Platforms in the Context of Educators' Innovation and Research Activities

The article is dedicated to the development of a universal methodology for assessing the quality of modern educational platforms. In the global digitalization of education, there is a growing need for a systematic approach to analyzing the effectiveness, accessibility, and user experience of learning platforms. The authors propose a methodology that considers eight key criteria: accessibility and inclusivity, usability and interface design, user interaction and engagement, user support and feedback, payment, adaptability to individual learning pace, multilanguage and localization, and certification. The research methodology combines quantitative and qualitative analysis methods, ensuring a comprehensive and objective assessment. A distinctive feature of the proposed approach is the use of the analytic hierarchy process to determine the weight coefficients of the criteria, enhancing scientific validity. An important aspect of the study is its focus on the needs of various user categories, particularly persons with disabilities, which makes the methodology inclusive. The article explores tools and approaches for evaluating existing platforms based on the proposed criteria and methodology, which holds practical value for developers and administrators of educational environments. The research findings will be useful to a wide range of professionals: developers of educational platforms, researchers

in the field of digital transformation of education, educators, and institutional leaders. The proposed methodology can serve as a foundation for developing quality standards for digital educational resources and will contribute to the advancement of a modern academic environment accessible to all users. The article emphasizes the importance of the continuous improvement of educational platforms in response to the dynamic development of digital technologies and society's evolving needs.

Keywords: *assessment methodology, open educational resources, educational platforms, digitalization of education, analytic hierarchy process, pairwise comparison matrix.*

Problem Statement

The aim of this article is to develop criteria and a methodology for assessing educational platforms that reflect their effectiveness, accessibility, and relevance to different user groups. To achieve this, it is necessary to define key evaluation criteria such as accessibility, content quality, usability, level of interaction, and inclusivity, and to create a methodology for platform analysis. A crucial aspect is addressing the needs of users with disabilities, making the approach inclusive and universal. Based on the analysis, it will be possible to provide recommendations for improving educational platforms, particularly in terms of content quality, interface usability, and interactivity. The study also includes a review of existing evaluation approaches, identifying their strengths and weaknesses, and integrating the most effective elements into the proposed methodology. Practical application involves preparing recommendations for developers on implementing criteria for inclusivity, quality, and usability. All of this contributes to a comprehensive assessment framework aimed at improving the quality and accessibility of educational platforms in the context of digital transformation in education.

Introduction

The digitalization of education is significantly transforming traditional learning approaches, making Open Educational Resources (OER) a key tool for accessing knowledge. Platforms for Massive Open Online Courses (MOOCs), Learning Management Systems (LMS), and Virtual Learning Environments (VLEs) have become an integral part of the modern educational landscape. These systems overcome geographic, economic, and social barriers, providing learning opportunities for people across the globe. However, to meet the needs of all users, it is essential to consider various aspects of educational platform quality, with inclusivity being just one of several critical components.

In this context, a key question arises: how can the effectiveness and quality of educational platforms based on open resources be assessed? The mere availability of materials does not guarantee their relevance, usability, or

alignment with pedagogical goals. This makes it essential to turn to academic research that examines the use of OER across diverse educational settings and proposes approaches for their critical evaluation. One such study is the article *"Evaluating Open Educational Resources: Lessons Learned"* [DeVries 2013], which reviews a decade of OER development starting from the MIT OpenCourseWare initiative and the UNESCO Paris Declaration. Although the number of open courses has grown rapidly, their effective use is often hindered by limited service support, diverse formats, language barriers, and differences in educational systems. Even with open Creative Commons licenses, adapting materials to new contexts often requires significant additional effort.

The authors see potential in the cumulative effect of OER – each new adaptation enhances the resource, making it more relevant and accessible to diverse audiences. A key principle is "open improvement", where materials are enriched by the knowledge and experience of new users, especially when modified versions are also shared under open licenses.

For successful OER integration, the authors recommend that institutions foster a culture of resource reuse, taking into account local needs and educational context. A key factor is combining the creation of new content with the adaptation of existing materials, while supporting pedagogical literacy and collaborative improvement practices. This approach enables the full potential of open education to be realized.

The challenges of adapting OER to various learning contexts naturally lead to the broader issue of their impact on educational equity. Openness alone does not guarantee accessibility for all user categories. This aspect is central to the study presented in the article *"Do MOOCs contribute to student equity and social inclusion? A systematic review 2014–18"* [Lambert 2019], which analyzes the impact of massive online courses on educational equity and social inclusion. A systematic review of 46 sources (including 24 empirical studies) shows that MOOCs can be an effective tool for underprivileged groups, challenging the common belief that they primarily serve privileged users. The key success factor was not licensing, but the careful design of courses that addressed the needs of the target audience.

The study identified two categories of materials: learning outcome reports and methodological recommendations. The analysis showed that the most effective practices combine online learning with additional support – offline groups, collaboration with nonprofit organizations, and engagement with local communities. Key effectiveness criteria included accessibility for vulnerable groups, multilingual availability, and adaptation for users with low levels of education.

The authors emphasize the potential of MOOCs to overcome educational barriers but note that inclusive practices often develop outside commercial platforms. Key recommendations include increasing cultural sensitivity,

strengthening collaboration with local communities, and improving student support models.

Thus, despite the significant potential of MOOCs in promoting educational inclusion, the effectiveness of OER largely depends on their ability to meet users' specific needs in various contexts. This leads to another important aspect – the perception and assessment of OER by educators themselves, as they serve as intermediaries between resources and students. In this context, the study presented in the article *"Would you use them? A qualitative study on teachers' assessments of open educational resources in higher education"* [Baas et al. 2022] is illustrative. It focuses on educators' experiences using open resources in higher education. The article explores how OER influence teaching practices through the lens of qualitative analysis. Unlike previous quantitative studies, the authors conducted in-depth interviews with instructors, allowing them to identify key barriers and motivational factors in the use of open resources.

The study identified five critical criteria for evaluating OER: content quality, design, usability, engaging potential, and clarity of materials. Group discussions around 'big' OER (complete courses) led to a noticeable shift in instructors' attitudes – from initial skepticism to recognition of their pedagogical potential. This process also served as a form of professional development.

The authors emphasize the need for institutional support: regular discussions of OER within teaching staff and the creation of mechanisms to adapt resources to local educational contexts. Such approaches could significantly enhance the effectiveness of integrating OER into higher education.

The evaluation of OER by educators helps to better understand the barriers and incentives for their use. However, no less important is the question of how to measure the overall quality of e-learning as a system. This issue is addressed in the study presented in the article "*Measuring Quality in the Context of e-Learning"* [Misut & Pribilova 2015], which proposes an innovative approach to assessing e-learning quality by combining the authors' ELQ model with an adapted version of the Kirkpatrick model. The ELQ model covers all key aspects of e-learning: from content quality and platform technical characteristics to organizational support and legal compliance. It includes specific methodological recommendations for content development, feedback organization, and updating regulatory documents.

The effectiveness of the model is assessed using Kirkpatrick's four-level system, which allows for a comprehensive analysis of learning outcomes – from student satisfaction to the actual impact on the educational process. Each level (reaction, learning, behavior, results) has clear measurement tools, ensuring the objectivity of the assessment.

Preliminary results from the implementation of this methodology have shown positive dynamics, particularly in the use of virtual classrooms and collaborative wiki resources. The combination of qualitative and quantitative approaches within the proposed system demonstrates great potential for improving e-learning platforms and enhancing the quality of distance education overall.

Comprehensive evaluation models, such as ELQ combined with Kirkpatrick's levels, allow for a more objective analysis of the quality of e-learning overall. However, it is equally important to consider specific national examples of OER implementation, which help identify regional challenges and opportunities. In this context, a notable study is *"Evaluation of the Open Course Ware Initiatives within the Scope of Digital Literacy Skills: Turkish Open CourseWare Consortium Case"* [Çakmak et al. 2013]. The article analyzes the development of OER in Turkey through the TUBA OCW initiative, focusing on their alignment with digital literacy requirements. Using a descriptive research method and a specially designed checklist, the authors found that the Turkish open course system is in its early stages of development. Most materials created by faculty members of local universities for undergraduate students are in PDF format, and a significant number of courses lack information on the creation date, which complicates the assessment of their relevance.

The study revealed a number of structural features and issues of the platform. The courses have a clear organization, determined by the national higher education system – they are usually divided into 14 thematic sections, unlike translated courses, which contain 21–30 topics. Although the platform uses Moodle, its functionality is primarily limited to storing PDF documents, without the use of interactive tools such as forums or wikis. A significant imbalance was also found in the disciplinary distribution, where social and natural sciences are represented much more comprehensively than technical specialties.

Based on the conducted analysis, the authors propose a set of measures to improve the system, including enhancing the use of Moodle's interactive features, involving more instructors from technical specialties, and integrating local educational initiatives. They emphasize the importance of systematically evaluating digital literacy for the continuous improvement of learning materials and fostering a culture of lifelong learning. The conclusions note that the future success of the initiative will depend on strengthening digital infrastructure and providing comprehensive support for OER projects at the national level.

The analysis of Turkey's experience shows that the development of OER is closely linked to the level of digital literacy, infrastructural support, and adaptation to local needs. However, another promising direction for the development of digital education is the rethinking of the role of students

themselves in content creation. This issue is addressed in the article *"Learnersourcing in the age of AI: Student, educator, and machine partnerships for content creation"* [Khosravi et al. 2023], which explores the innovative learnersourcing model – a partnership between students, educators, and artificial intelligence in the content creation process. While such a practice fosters deeper knowledge acquisition and critical thinking development, it also faces challenges, including uneven quality of student materials, motivational difficulties, and the lack of specialized platforms. The authors propose a comprehensive model that combines pedagogical approaches with advancements in artificial intelligence to overcome these limitations.

The main focus of the research is ensuring the quality of student-generated content. Instead of the traditional teacher-led evaluation, which is labor-intensive, alternative methods are considered. A peer-assessment system not only reduces the burden on instructors but also develops important skills such as critical thinking and self-assessment. To enhance the effectiveness of this approach, clear evaluation criteria, examples of quality work, and comparative analysis methods are used.

An important direction is the integration of artificial intelligence into the assessment process, which allows for the automation of processing large volumes of data. Special attention is given to the development of transparent algorithms that not only evaluate the quality of work but also provide students with clear feedback for improving their materials. This approach opens up new opportunities for creating effective educational ecosystems, where technology enhances the pedagogical potential of learnersourcing.

A review of current research demonstrates a variety of approaches to the development, assessment, and implementation of OER, highlighting both the potential and challenges associated with their use in various educational contexts. Summarizing these results, it can be concluded that the effectiveness of OER is largely determined not only by the availability of access but also by the ability of resources to meet the diverse needs of users. Therefore, modern educational platforms must not only be accessible but also effective, user-friendly, and adaptable to different user needs. This includes both technical stability and the quality of educational content, as well as considering the characteristics of various user groups: from students with disabilities to those with limited internet access or using different devices for learning. Inclusivity, in particular, involves adapting resources for people with disabilities, but it is also important to consider the needs of all user groups, including those with different levels of digital literacy or cultural contexts.

One of the key challenges is ensuring equal access to educational resources for all students. Many open educational platforms do not provide text versions of video courses, making it difficult for people with hearing impairments to access knowledge. In addition, many platforms do not take

into account the needs of users with limited access to high-speed internet or those using outdated devices. This highlights the need for a comprehensive approach to assessing the quality of educational platforms that considers various factors.

The assessment of the quality of educational platforms should include criteria such as interface usability, content quality, technical stability, adaptability to different user needs, and compliance with international standards. For example, the WCAG [Web Content Accessibility Guidelines 2024] standards define accessibility requirements for web content for people with disabilities, but they also promote overall usability of platforms for all users. Furthermore, an important aspect is the integration of technological solutions such as subtitles, screen readers, and adaptive interfaces, which enhance the learning experience for everyone.

Some platforms actively integrate inclusive technologies, enabling them to ensure the accessibility of materials for people with disabilities. However, to achieve maximum effectiveness, it is necessary to consider the needs of all user groups, including those facing technical or social limitations. This approach will allow us to determine how well educational platforms meet the needs of different user groups and offer recommendations for improvement. In the future, inclusivity in digital learning will become even more significant, as technological progress creates new opportunities for content adaptation and the integration of innovative solutions. Therefore, developing universal criteria for assessing the quality of educational platforms is an important step toward creating fair and accessible educational systems for all.

Assessment Criteria and Methodology

Scale selection. Evaluating the quality of educational platforms requires not only clear criteria but also a universal scale that allows for a quantitative assessment of compliance with each criterion. This minimizes subjectivity and ensures a structured analysis.

Without a unified evaluation system, comparing platforms becomes subjective. A scale allows for standardizing the analysis, detailing strengths and weaknesses, and helps users choose a platform based on the parameters that are important to them.

A 5-point scale is optimal due to its simplicity, intuitiveness, and balance between detail and convenience. It covers a range of ratings from 1 (minimal compliance) to 5 (maximum compliance). Alternative scales may be either too detailed or not informative enough.

For binary parameters (e.g., the presence of a mobile app), a 2-point system (0 or 1) is appropriate. This ensures flexibility and accuracy in evaluation without compromising the overall structure of the analysis.

Therefore, the 5-point scale is the optimal choice for objective evaluation of educational platforms, allowing for the identification of their strengths and weaknesses.

Metrics. Evaluating an educational platform requires not only an intuitive approach but also objective metrics – measurable characteristics that allow for a quantitative assessment of compliance with specific criteria. These metrics help formalize the analysis by converting subjective impressions into concrete numerical indicators. For example, the level of interactivity can be assessed based on the number of tests, tasks, or the amount of time users spend on the platform.

Metrics detail the evaluation and make it more substantiated. For example, instead of a general statement about the user interface's usability, indicators such as navigation speed or the number of clicks required to perform key actions can be considered. This allows for analyzing the platform from different angles and avoiding unfounded generalizations.

Metrics ensure objectivity, granularity, comparability, and transparency. They make it possible to evaluate platforms based on unified criteria, simplify the comparison of different services, and clarify the results obtained. As a result, developers can improve the platform by focusing on specific indicators.

Importantly, metrics allow broad concepts such as "usability" or "multilanguage" to be transformed into measurable characteristics that can be combined into a comprehensive evaluation. This makes the platform analysis structured and reliable, enabling the identification of both strengths and weaknesses.

Selection of criteria for assessing educational platforms. During the study of educational platforms, the key aspects influencing learning effectiveness and convenience were identified. Based on the analysis of existing research, user feedback, and a comparison of popular platforms, a set of quality assessment criteria was developed: accessibility and inclusivity, usability and interface design, user interaction and engagement, user support and feedback, payment, adaptability to individual learning pace, multilanguage and localization, and certification.

Accessibility and inclusivity. This criterion assesses how well the platform accommodates users with diverse abilities, including individuals with visual, auditory, motor, or cognitive impairments. An important aspect is mobile accessibility, as many users engage in learning via smartphones. The evaluation is based on the following metrics: availability of accessibility features (such as screen reading and text scaling), availability of a mobile application, and the quality of its functionality.

Usability and interface design. This criterion evaluates how intuitive and user-friendly the platform's interface is. The assessment is based on the following metrics: interface intuitiveness, design aesthetics, and the number

of clicks required to perform key actions. Platforms with minimalist design, fast navigation, and adaptability to various devices provide a better user experience.

User interaction and engagement. This criterion evaluates the extent to which the platform encourages active user participation in the learning process through interaction with content, instructors, and fellow learners. The assessment uses a metric based on the number of interactive elements, such as quizzes, assignments, simulations, and discussions.

User support and feedback. This criterion assesses how well the platform provides assistance to users during the learning process, including technical support and academic feedback. The evaluation is based on the following metrics: availability of technical support and the quality of feedback.

Payment. This criterion evaluates how well the cost of learning corresponds to the quality of services and user expectations. It includes an assessment of pricing policy, availability of free materials, flexibility of pricing plans, and the possibility of publishing materials free of charge.

Adaptability to individual learning pace. This criterion evaluates the platform's ability to adjust to different rates of material comprehension. The assessment is based on the following metrics: flexibility in course progression and content adaptability.

Multilanguage and localization. This criterion evaluates how accessible the platform is to users with different languages and cultural backgrounds. The assessment is based on the following metrics: interface localization and content localization

Certification. This criterion assesses the possibility of obtaining official certificates or diplomas upon course completion. The evaluation is based on the following metrics: availability of a certificate and a diploma.

From criteria to practical implementation. The criteria and metrics discussed provide a foundation for developing an objective system for assessing the quality of educational platforms. For practical application, it is necessary to develop a detailed plan that includes forming an expert team, selecting analysis tools, and building mathematical models for calculating the indicators.

Forming a working group. To ensure a comprehensive and objective assessment of an educational platform, it is essential to form a team of experts with diverse competencies. The involvement of specialists from various fields enables in-depth analysis of each criterion and ensures the objectivity of the results.

Key roles and competencies. Educational content expert – analyzes the quality, relevance, and compliance of materials with educational standards.

UX/UI design expert – evaluates interface usability, navigation intuitiveness, and platform accessibility.

Technical specialist – examines performance, functionality, and compatibility with various devices.

Team coordinator – organizes the team's work, coordinates information exchange, and formulates final conclusions.

Stages of the working group's process.

1. Planning and task distribution – the coordinator assigns tasks to each expert, sets deadlines, and schedules discussion periods.
2. Data collection and processing – experts conduct evaluations in their respective areas using a standardized format for subsequent analysis.
3. Analysis and synthesis of results – based on individual evaluations, a consolidated table is created, which serves as the basis for the final platform assessment.

A clear distribution of roles and work stages increases the objectivity and accuracy of the assessment, ensuring a comprehensive analysis of platform quality.

Selecting tools and resources for analysis. To ensure a high-quality assessment of educational platforms, it is necessary to select appropriate tools that enable systematic data collection, processing, and analysis. The choice depends on the specifics of the criteria, resource availability, and accuracy requirements. Key data collection tools include analytical platforms (e.g., Google Analytics) for analyzing user behavior, surveys and questionnaires for obtaining subjective evaluations, focus groups and interviews for in-depth exploration of user experiences, as well as event logs and trackers for automatically recording user interactions with the platform.

For data processing and analysis, resources such as spreadsheet applications (e.g., Excel) are used for handling quantitative data and creating charts; statistical packages (SPSS, Python) for in-depth statistical analysis; and visualization tools (Power BI, Tableau) for clear presentation of the results.

The selection of tools should be based on criteria such as ease of use, scalability for processing large volumes of data, and alignment with assessment goals to ensure the accuracy and reliability of results. Choosing the right tools and resources ensures systematic, accurate, and objective evaluation, which is essential for obtaining reliable outcomes.

Defining hypotheses and expectations regarding results. Before evaluating an educational platform, it is important to define hypotheses and expectations that will serve as the basis for analysis. Hypotheses help formulate clear objectives, reduce subjectivity, and focus on key aspects that matter to the target audience. They are based on the analysis of similar platforms or user experience.

Key hypotheses include:

- Platform accessibility – support for various devices and features for users with disabilities.

- Usability – an intuitive interface, logical navigation, and a low entry barrier for new users.
- Content quality – up-to-date, well-structured educational materials that meet modern standards.
- Interactivity and engagement – presence of quizzes, simulations, and discussion forums for active learning.
- User support – prompt technical assistance and the ability to receive answers to questions.

Defining hypotheses helps establish priorities, reduce the risk of subjectivity, and facilitate the interpretation of results. Deviations from the hypotheses indicate specific areas for platform improvement. This stage provides an essential foundation for the objective analysis of platform quality.

Formulating questions for metric assessment. To objectively assess an educational platform, questions are developed for each metric to gather specific data on the platform's alignment with the criteria. Two types of questions are used: quantitative (with answers on a scale, for example, a 5-point rating for interface usability) and binary (with answers of "yes" or "no", for example, the availability of a mobile version). The questions cover both quantitative and binary aspects, providing a complete picture of the platform's quality.

For convenience, they are grouped according to the criteria in Table 1.

Averaging ratings from multiple experts. For an objective evaluation of platforms, it is essential to consider the methodology for analyzing results. If the as-

Table 1. OER assessment criteria

Criterion	Metrics	Question
Accessibility and inclusivity	Availability of accessibility features	Text descriptions for videos and images
		Support programs (financial aid, or assistance with housing and special equipment for taking exams, etc.)
	Availability of a mobile application	Availability of an official mobile app for iOS
		Availability of an official mobile app for Android
		User ratings and reviews of the mobile app in the App Store and Google Play
	Availability of accessibility features	Responsiveness and adaptability of the interface
		Ease of navigation and interaction with the interface on a small screen
		Ability to complete all courses, view materials, and submit assignments via mobile devices without limitations
		Offline access to materials (e.g., downloading lectures or text content for offline use)
		Integration with mobile notifications for reminders about assignments, events, or course updates

Continuation of Table 1

Criterion	Metrics	Question
Usability and interface design	Interface intuitiveness	Time required to master the platform's core functions
	Aesthetics and design	Simplicity and minimalism of the interface: absence of cluttered elements, visual clarity, and clean design
		Logical placement of control elements: menus, buttons, and icons are positioned for easy discovery and use
	Number of steps required to perform core actions	Number of steps (clicks) required to complete common tasks (accessing lectures, practical exercises, etc.)
User interaction and engagement	Number of interactive elements	Course saturation with quizzes, assignments, exercises, or simulations
		Gamification of courses, game-based elements (e.g., achievements, points, levels, and leaderboards)
		Independent work on practical tasks (e.g., programming, problem solving, interactive case studies)
	Methods for supporting active learning	Forums, chats, or other platforms for discussions and questions
		Progress tracking, completeness and quality of instructor feedback (individual comments, answers to questions)
		Webinars or live sessions with instructors
User support and feedback	Availability of support services	Variety of support contact channels (chat, email, phone, forums)
		Availability of support (e.g., 24/7 service or limited hours)
Payment	Cost of learning	Cost of courses, programs, subscriptions, or additional resources
	Availability of free materials	Share of educational content available for free
	Possibility to publish materials for free	Possibility to publish new content for free
Adaptability to individual learning pace	Course progression flexibility	Ability for students to choose their own pace for lessons and modules (individual learning pace)
	Content adaptability	Variety of learning programs (courses, projects, diploma programs, etc.)
		Possibility of a personalized learning plan based on the student's knowledge level (e.g., more complex tasks for advanced learners and simpler ones for beginners)
Multi-language and localization	Interface localization	Number of languages into which the platform interface is translated
		Completeness of the translation of platform elements (including interface, instructions, help materials, tasks, and course content)
	Content localization	Number of languages into which the learning materials are translated
		Availability and completeness of subtitles (e.g., subtitles in different languages)

End of Table 1

Criterion	Metrics	Question
Certification	Availability of a certificate	Availability of a certificate
		Professional certification
		Free certificates
	Availability of a diploma	Availability of a diploma

sessment is conducted by a single person, the results may be subjective. Therefore, using multiple experts allows for the application of statistical methods, such as the median (to exclude the influence of extreme values) and the arithmetic mean (to average the data). A larger number of evaluators improves the accuracy of results and reduces the risk of subjective errors, which is especially important when analyzing aspects such as usability, accessibility, functionality, and platform adaptability.

Principles of metric value calculation. The calculation of metric values makes it possible to objectively assess the quality of a platform according to various criteria. For this purpose, both quantitative (a scale from 0 to 5) and binary ("yes" = 5, "no" = 0) questions are used. The results are aggregated using the arithmetic mean method, where the score for each question is divided by the total number of questions.

The formula for calculating the average metric value, M, is as follows:

$$M = \frac{\sum_{i=1}^{n} O_i}{n}, \quad (1)$$

where O_i – score for each individual question, n – total number of questions.

For quantitative parameters, such as the number of steps required to access learning materials, threshold values are applied:

2–3 steps = 5 points (optimal usability);
4 steps = 4 points;
5 steps = 3 points;
6 steps = 2 points;
7 steps = 1 point;
8 or more steps = 0 points.

This approach allows for a quick assessment of navigation usability and simplifies the comparison of platforms. After calculating the values for individual metrics, they are combined into an overall criterion score using the arithmetic mean, which makes it possible to calculate the global quality score of the platform.

Determining global and local priorities. To calculate the final quality score of a platform, it is necessary to determine the priorities of the criteria and

metrics, since different aspects may carry different weights depending on user needs. Global priorities reflect the importance of criteria (e.g., "Accessibility" or "Usability"), while local priorities indicate the importance of individual metrics.

To determine global priorities, the analytic hierarchy process (AHP) is used, which includes:

1. Forming a pairwise comparison matrix – comparing the criteria with each other using the Saaty scale (from 1 to 9) (see Tables 2 and 3). For example, if "Accessibility" is more important than "Interactivity," it is assigned a score of 5 (or 1/5 for the reverse comparison).

Table 2. Pairwise comparison matrix for criteria

	Accessibility	Usability	Interactivity	Support	Payment	Adaptability	Multilanguage	Certification
Accessibility	1	2	2	3	4	2	3	2
Usability	1/2	1	1	2	3	1	2	1
Interactivity	1/2	1	1	2	3	1	2	1
Support	1/3	1/2	1/2	1	2	1/2	1	1/2
Payment	1/4	1/3	1/3	1/2	1	1/3	1/2	1/3
Adaptability	1/2	1	1	2	3	1	2	1
Multilanguage	1/3	1/2	1/2	1	2	1/2	1	1/2
Certification	1/2	1	1	2	3	1	2	1

Table 3. Interpretation of scores

Score	Interpretation
1	Criteria are equally important
3	Moderate preference of one criterion over another
5	Strong preference of one criterion over another
7	Very strong preference of one criterion over another
9	Absolute preference of one criterion over another
2, 4, 6, 8	Intermediate values for flexible comparison

2. Calculation of the Priority Eigenvector – involves computing the weight values for each criterion. This is done by multiplying the values in each row of the matrix, extracting the n-th root (where n is the number of criteria), and normalizing the results to obtain percentage weights.

For the matrix in Table 2, the first component of the eigenvector is calculated as follows:

$$\sqrt[7]{1 \times 2 \times 2 \times 3 \times 4 \times 2 \times 3 \times 2} = 2.21$$

The results of the calculation for all components of the eigenvector are presented in Table 4.

Table 4. Results of eigenvector calculation

	Accessibility	Usability	Interactivity	Support	Payment	Adaptability	Multilan-guage	Certification	Eigenvector
Accessibility	1	2	2	3	4	2	3	2	2.21
Usability	1/2	1	1	2	3	1	2	1	1.25
Interactivity	1/2	1	1	2	3	1	2	1	1.25
Support	1/3	1/2	1/2	1	2	1/2	1	1/2	0.67
Payment	1/4	1/3	1/3	1/2	1	1/3	1/2	1/3	0.41
Adaptability	1/2	1	1	2	3	1	2	1	1.25
Multilanguage	1/3	1/2	1/2	1	2	1/2	1	1/2	0.67
Certification	1/2	1	1	2	3	1	2	1	1.25

The result of the normalized eigenvector W_i calculation is presented in Table 5.

Table 5. Result of eigenvector normalization

	Accessibility	Usability	Interactivity	Support	Payment	Adaptability	Multilanguage	Certification	Eigenvector	Normalized eigenvector
Accessibility	1	2	2	3	4	2	3	2	2.21	0.25
Usability	1/2	1	1	2	3	1	2	1	1.25	0.14
Interactivity	1/2	1	1	2	3	1	2	1	1.25	0.14
Support	1/3	1/2	1/2	1	2	1/2	1	1/2	0.67	0.07
Payment	1/4	1/3	1/3	1/2	1	1/3	1/2	1/3	0.41	0.05
Adaptability	1/2	1	1	2	3	1	2	1	1.25	0.14
Multilanguage	1/3	1/2	1/2	1	2	1/2	1	1/2	0.67	0.07
Certification	1/2	1	1	2	3	1	2	1	1.25	0.14
									Σ8.97	Σ 1.0

This approach makes it possible to objectively determine the relative importance of the criteria and ensures the accuracy of the platform's final assessment.

Consistency check of the pairwise comparison matrix. In the AHP, it is essential to ensure the consistency of the pairwise comparison matrix to avoid subjective errors and to guarantee the reliability of the weight coefficients. For this purpose, the consistency index (*CI*) and the consistency ratio (*CR*) are calculated.

The verification procedure includes:

1. Calculation of the maximum eigenvalue of the matrix by summing the S_i values of each column, which is determined using the following formula:

$$\lambda \sum_{i=1}^{7} S_i \times W_i \quad (2)$$
$$max$$

In this case:

$$\lambda_{max} + 21 \times 0.05 + 7.33 \times 0.14 + 13.5 \times 0.07 + 7.33 \times 0.14 = 8.04$$

2. Calculation of the *CI* using the formula:

$$CI = \frac{\lambda_{max}}{n-1}. \quad (3)$$

3. Calculation of the *CR*:

$$CR = \frac{CI}{RI}, \quad (4)$$

where *RI* is the random index for a matrix of order *n* (for *n* = 7, *RI* = 1.34).

If *CR* ≤ 0.1 (10%), the matrix is considered consistent. If *CR* > 0.1, the comparisons should be reviewed and the matrix values adjusted.

The results of the consistency check are presented in Table 6.

Local priorities for the metrics are determined similarly, either by applying the AHP or by assigning weight values based on expert assessments.

Using global and local priorities in final calculations. Global and local priorities are used to calculate the final quality score of the platform. This approach allows for the importance of each criterion and metric to be taken into account, ensuring the accuracy and objectivity of the assessment.

To calculate the score of a given criterion, the goal programming method is used, which minimizes the deviation from the ideal value (5 points) for each metric. The formula for calculating the score of criterion *K* is as follows:

$$K = 5 - \sqrt{\sum_{i=1}^{m} w_i \cdot (5 - M_i)^2}, \quad (5)$$

where M_i – score of metric *i*;
w_i – weight coefficient of metric *i*;
m – number of metrics.

Table 6. Consistency check results

	Accessibility	Usability	Interactivity	Support	Payment	Adaptability	Multilan-guage	Certification	Normalized eigenvector
Accessibility	1	2	2	3	4	2	3	2	2.21
Usability	1/2	1	1	2	3	1	2	1	1.25
Interactivity	1/2	1	1	2	3	1	2	1	1.25
Support	1/3	1/2	1/2	1	2	1/2	1	1/2	0.67
Payment	1/4	1/3	1/3	1/2	1	1/3	1/2	1/3	0.41
Adaptability	1/2	1	1	2	3	1	2	1	1.25
Multilanguage	1/3	1/2	1/2	1	2	1/2	1	1/2	0.67
Certification	1/2	1	1	2	3	1	2	1	1.25
	3.92	7.33	7.33	13.50	21.00	7.33	13.50	7.33	Σ 1.0
							λ_{max}		8.04
							CI		0.005
							CR		0.004

To calculate the global platform score, the weights of the criteria are taken into account:

$$\text{Global Platform Score} = 5 - \sqrt{\sum_{i=1}^{k} w_i \cdot (5 - K_i)^2}, \quad (6)$$

where K_i – score of criterion i;
w_i – weight coefficient of criterion i;
k – number of criteria.

The global score ranges from 0 to 5, with 5 indicating the highest quality. High values reflect the platform's alignment with the evaluation criteria, while low values point to significant shortcomings.

This approach ensures a balanced assessment by taking into account the importance of each criterion and metric, and it helps identify key areas for platform improvement.

Conclusion

The article presents a systematic approach to developing criteria and a methodology for assessing the quality of educational platforms, particularly OER. The primary focus is on formulating key criteria such as accessibility, usability, interactivity, and inclusivity, which enable a comprehensive analysis of platform effectiveness. The proposed assessment methodology takes into

account the needs of various user categories, including individuals with special needs, making it a universal and adaptable tool in line with the modern demands of digital education.

An important outcome of the study is the development of a structured methodology that can be used for future assessments of educational platforms. This methodology makes it possible to systematize the analysis process, identify key quality parameters, and establish a foundation for the further improvement of educational environments.

In the future, further research may focus on the practical application of the proposed methodology to the assessment of specific platforms, as well as on expanding the list of criteria to account for emerging technologies such as artificial intelligence, virtual reality, and other innovative solutions.

Thus, the article makes a significant contribution to the development of methodologies for evaluating educational platforms by proposing a structured approach that can serve as a foundation for future research in this field. The proposed criteria and methodology lay the groundwork for creating inclusive, user-friendly, and effective educational environments that meet the demands of the modern digital world.

Note. The study was conducted within the framework of the Erasmus+ project *Students' Personalised Learning Model, Based on the Virtual Learning Environment of Intellectual Tutoring "Learning with No Limits" (SMART-PL).*

Примітка. Дослідження проводилось в рамках проєкту Erasmus+ *Students' Personalised Learning Model, Based on the Virtual Learning Environment of Intellectual Tutoring "Learning with No Limits" (Персоналізована модель навчання студентів на основі віртуального навчального середовища інтелектуального наставництва «Навчання без обмежень») (SMART-PL).*

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Максим Максимов, Валентин Давидов, Тая Петік, Максим Грішин. **Розробка методики оцінювання освітніх платформ в контексті інноваційно-дослідницької діяльності освітян**

Стаття присвячена розробці універсальної методики оцінки якості сучасних освітніх платформ. У контексті глобальної цифровізації освіти зростає потреба у системному підході до аналізу ефективності, доступності та користувацького досвіду навчальних платформ. Автори пропонують методику, що враховує вісім ключових критеріїв: доступність та інклюзивність, зручність використання та інтерфейс, інтерактивність та залученість користувачів, підтримка користувачів та зворотній зв'язок, платність, адаптивність до індивідуального темпу навчання, багатомовність та локалізація і сертифікація.

Методологія дослідження базується на поєднанні кількісних і якісних методів аналізу, що забезпечує комплексність і об'єктивність оцінки. Особливістю запропонованого підходу є використання методу аналізу ієрархій для визначення вагових коефіцієнтів критеріїв, що підвищує наукову обґрунтованість результатів.

Важливим аспектом дослідження є орієнтація на потреби різних категорій користувачів, зокрема осіб з обмеженими можливостями, що робить методику дійсно інклюзивною. У статті розглянуто інструменти та підходи до оцінювання існуючих платформ на основі запропонованих критеріїв і методики, що має важливе прикладне значення для розробників і адміністраторів освітніх середовищ.

Результати дослідження будуть корисні для широкого кола фахівців: розробників освітніх платформ, дослідників у сфері цифрової трансформації освіти, викладачів та керівників навчальних закладів. Запропонована методика може стати основою для створення стандартів якості цифрових освітніх ресурсів та сприятиме розвитку сучасного освітнього середовища, доступного для всіх категорій користувачів. Стаття підкреслює важливість постійного вдосконалення освітніх платформ у зв'язку з динамічним розвитком цифрових технологій та зміною потреб суспільства.

Ключові слова: *методологія оцінювання, відкриті освітні ресурси, освітні платформи, цифровізація освіти, метод аналізу ієрархій, матриця парних порівнянь.*

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