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Artificial Intelligence Potential in Higher Education Institutions Enhanced Learning Environment in Romania and Serbia

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Abstract: In their struggle to offer a sustainable educational system and transversal competencies for market requests, significant transformations characterise the higher education system in Serbia and Romania. According to EU policy, these transformations are related to educational reforms and the introduction of new technology and methodologies in teaching and learning. They are expected to answer to the PISA requirements and to increase the DESI (Digital Economy and Society Index). They are also likely to mitigate the inequity of HEIs (higher education institutions), empowered by a structured, goal-oriented strategy towards agile management in HEIs that is also appropriate for new market demands. Our study is based on an exploratory survey applied to 139 Romanian and Serbian teachers from the Information Technology School—ITS, Belgrade, and Spiru Haret University, Romania. The survey let them provide their knowledge of AI or their perceptions of the difficulties and opportunities of these technologies in HEIs. Our study discovered how difficulties and opportunities associated with AI impact HEIs. This study aims to see how AI might assist higher education in Romania and Serbia. We also considered how they might be integrated with the educational system, and if instructors would utilise them. Developing creative and transversal skills is required to anticipate future breakthroughs and technological possibilitiesThe new methods of education focuses on ethics, values, problem-solving, and daily activities. Students' learning material, how they might achieve critical abilities, and their educational changes must be addressed in the future. In this environment, colleges must create new digital skills in IA, machine learning, IoT, 5G, the cloud, big data, blockchain, data analysis, using MS Office and other applications, MOOCs, simulation applications, VR/AR, and gamification. They must also develop cross-disciplinary skills and a long-term mindset.

Keywords: higher education institutions (HEI); artificial intelligence (AI); transversal skills

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1. Introduction

Regarding the quality of academic performance among students, PISA shows that students' socioeconomic status still significantly impact their academic performance. According to a study in Singapore, the country with the best education system, "Wrong recruitment decisions can result in 40 years of poor teaching". As a result, it is not just about your school, but the system's overall success. Moreover, they stress that students learn at different points in their lives [1].

High-quality learning outcomes and relevant competencies are the goals of HE. The quality of education is assessed using appropriate methods to addresses current and future issues. Blockchain and MOOCs can improve education. Externally conducted internships, simulations and experiments by practitioners, and degree theses developed with non-HEI organisations may represent educational quality. Additionally, student engagement and learning outcomes are important markers of instruction quality.

"Rewrite the Meritocracy" is the ground of the Singaporean system. For the ability to lead, manage, and achieve coherence in teaching and learning, goals and standards must be clearly defined and rigorously enforced. Moreover, teachers and administrators must be of the highest calibre [2–5]. Rewards and recognition programs can motivate employees, such as honours and salary bonuses. The students should also be evaluated individually, following their excellence strategy. However, emphasising the meritocracy alone is not enough to guarantee equity [6].

In European countries, digital performance and evolution in digital competitiveness are evaluated by the Digital Economy and Society Index (DESI), a composite index. The DESI is composed of connectivity, human capital related to the internet, the use of internet services and online businesses, the integration of digital technology, and digital public services such as e-government and e-health [7]. Technology refers to facilities brought by Massive Open Online Courses (MOOCs), e-learning platforms, artificial intelligence (AI), and blockchain. Methodology refers mainly to implementing new teaching styles such as learning by doing, solving problems, gaming, interactive teaching, and developing transversal competencies and transferable knowledge. According to the DESI, Nordic countries (the Netherlands, Lithuania) have the most advanced digital economies, are the top performers in terms of internet user skills, advanced skills, and development, and have the highest rate of information and communications technology (ICT) usage by workers, as well as the highest shares of ICT specialists in total employment. At the same time, Bulgaria, Romania, Italy, and Serbia oppositely tilt the scale/balance, but they all have great potential for improvement. Furthermore, through its Digital Skills and Jobs Coalition, the Commission seeks to further reduce the digital skill gaps by fostering the sharing, replicating, and upscaling of best practices in training and matching for digital jobs, certification, and raising awareness [8].

Keeping this context in mind, universities have to create new learning environments that support the understanding of digital technologies. They might use technology, such as MOOC platforms [9,10], blockchain, and AI, to facilitate problem-based learning by performing creative simulations and experiments. The balance between working and social life could be more manageable if AI facilities were implemented correctly in e-learning and on e-learning platforms. Modern students must be prepared for the future's businesses and be capable of solving different problems with the transversal skills acquired. Therefore, these universities must create transversal and transferable skills [11,12]. This would be made possible by the innovative mindset of the teachers and their ability to juggle disruptive innovations. They will bring a competitive advantage, facilitate the smooth transition from school to the business field, and evolve continuously and include sustainable development goals (SDGs) in education transversally [4,13].

This study involves cabinet research, examining the academic units of available knowledge and experience. Various publications of international and national institutions were used as sources, including: OECD, USAID, UNESCO, the European Commission, the United Nations, the World Economic Forum, IASA, the Republic of Serbia Government, and the Statistical Office of the Republic of Serbia [14–24]. In addition, this is exploratory research, given that data from 103 Serbian teachers from the Information Technology School—ITS, Belgrade, and Spiru Haret University, Romania were analysed to determine these teachers' knowledge of AI or their perceptions of the difficulties and applications of these technologies in HEIs. Our study evaluates the challenges met in the implementation of AI in HEIs, the applications brought by the performance of AI in HEIs, and the influences between them.

The motivation for this research is the intention of the researchers to comprehensively view and present the higher education sector in the Republic of Serbia and Romania. In addition, researchers in higher education institutions in these countries are interested in implementing modern technologies in education and are actively involved in their implementation and use in their faculties.

The study's objective is to discover the main difficulties and applications brought by AI technology in the current stage of the educational system in Romania and Serbia and to discover if the teachers are eager to implement those technologies in their teaching process. Therefore, the main focus of the research is dealing with the objectives of our analysis and analysing formative and reflective variables.

We used the IMRaD model (introduction, methods, results, and discussion) for the paper structure, with modifications. Following the introduction chapter, we will offer a necessary theoretical background in a chapter with the same title, clarifying the goals of higher education and providing explanations regarding AI. Following that, we will conduct a SWOT analysis of the Serbian and Romanian higher education systems. The methodology chapter will provide the model built for this research study and the strategies that we will utilise to perform our research. We will present the study objective, the survey that will be conducted, and the variables and hypotheses that will be employed. We will provide the findings of our investigation in this chapter. In the discussion chapter, we will explore the essential findings of our study and compare them to the findings of other recent studies. At the end of the chapter, we will conclude the study and examine the theoretical basis, implications, limitations, and subsequent actions.

2. Theoretical Background

The Common Digital Competence Framework for Teachers emphasises five directions for obtaining digital competence for teachers: information and data literacy, communication and collaboration, digital content creation, safety, and problem solving [25].

Information and data literacy was addressed in HEIs and refers to performing the analysis, interpretation, comparison, and evaluation of sources of data, as well as information on the basics of AI and its applications, and applying searches to obtain data and information for applying leading AI technologies.

Communication and collaboration are essential in student–teacher relations, and offer the opportunity to develop imaginative and transversal skills to anticipate future inventions and the potential of new technologies [25]. Ethics, values, engaging students in problem solving, and day-by-day activities must at the leading edge of education. The issues regarding learning content for students, the way they can learn these broader competencies, and what changes are required in the education sector must be addressed in the right way in the future [18,19,26,27].

Digital content creation refers to applying the different ways to modify, refine, improve, and integrate simple items of new content and information to create new and original ones. In this regard, universities need to develop new digital skills, such as AI, machine learning, IoT, 5G, the cloud, big data, blockchain, data analysis, using MS Office and other applications, MOOCs, simulation applications, virtual reality/augmented reality (VR/AR), and gamification [28–30]. In addition, they need to develop transversal interdisciplinary skills and multidisciplinary hubs with a sustainable mindset [13]. Finally, problem solving refers to evaluating, selecting, and using appropriate digital tools and technologies to represent capabilities and basic AI algorithms, and to apply different digital tools and technologies to define problems and select the appropriate means for problem solving.

2.1. HE Objectives and Information and Data Literacy

The objectives of HE are fostering sustainable learning outcomes, providing high-quality teaching and education, and developing adequate competencies while following sustainable economy requirements. Learning outcomes in HE depend on the appropriate methods for evaluating the quality of education. There are many difficulties, including the diversity of the participants, the teaching infrastructure, inappropriate management regarding funding, curricula, transferable competencies, knowledge transfer, interactivity with students, making learning easy and fun with creative game applications, simulations, experiments, and problem-solving activities. Creating an appropriate environment for study will increase student participation in classes, creativity, and innovation. Sustainable education will answer the current and future economic, environmental, and medical difficulties. Quality education can be implemented by utilising blockchain technology and MOOC platforms. Blockchain technology allows users to be rewarded with discount vouchers for their activities. These vouchers might be converted into virtual currency [31]. A high user commitment will follow this system in the learning and teaching process if the socio-psychological human needs are addressed through face-to-face interaction and psychological compensations. More research must be conducted to develop innovative solutions [2–5].

The quality of education might be reflected in the students' and staff's performance and their impact on the economy and environment, successful graduate employment, internationalisation, fructuous collaboration with the work environment, such as through internship inclusion, practical experience, simulations, and experiments conducted by practitioners from outside the HEI, and degree theses elaborated in partnership with non-HEI organisations. However, the leading indicator for the instruction endowment is student commitment and the educational process outcomes [32,33].

2.2. AI, Backgrounds

Artificial intelligence is observed as an area of computer science that observes intelligent machines that operate and think like humans. This includes speech recognition, natural language processing (NLP), image recognition, etc. ML presents the usage of AI in enabling the systems to learn and develop based on experience without explicitly programming them to do so. In machine learning, for example, computers learn from data, not coded instructions [34].

The use of AI in different fields boomed in the last years, teaching and learning in higher education being only one dimension of this evolution. Innovative digital solutions emerge almost every month from sectors that are as different as possible, such as health, manufacturing, logistics, creative industries, design, defence, public goods, accountability, and many others. Therefore, investigating the implications of emerging technologies for education is an important aspect. Artificial intelligence is progressing at an accelerated pace, which already impacts the profound nature of services within higher education. On one hand, students should learn how AI will change the future of jobs.

On the other hand, HEI should adapt the way they teach, applying new technologies in the educational and pedagogical practices. In both methods, adopting new technologies in higher education has to be accelerated to keep pace with other training options for the students in an open environment. There are challenges in teaching, learning, student support, and innovative or entrepreneurial universities that open many research directions [35,36]. HEIs should not only keep pace with developments in new technologies and the computing capacities of new intelligent machines, but should be at the centre of this transformation as a digital innovation hub. Therefore, many universities took a step forward in becoming the core of digital transformation for many European countries under the concept of EDIH, or European Digital Innovation Hubs, where AI is the centre of attention [35].

Concerning real or virtual settings, an AI system can make forecasts, suggestions, or judgments to answer a set of human-defined objectives. AI systems are supposed to be partially self-sufficient [18]. AI tools are used in education to explain and assist with learning and teaching [35]. By 2025, the global education focused expenditure on AI in education will exceed USD 6 billion. China will lead this growth, accounting for almost half of the worldwide AI education investment [36].

2.3. The Difficulties and Barriers to Providing Services in HEI

Every country is experiencing disruptions, such as shifting geopolitical powers, changing jobs, or a lack of educational applications due to new technologies such as AI and robotics or 5G, which require a new mindset and new methods of education. Some of these methods include universities without walls, experimental problem-solving, home education, MOOCs under blockchain technologies such as Tutellus [2,3], and a discrepancy between what businesses need and what academic and vocational education can provide.

The consequences of the post-COVID-19 period are dire: low-income countries have 86% of their kids in school, compared to just 20% in high-income countries, with a loss of 30% in reading comprehension and 50% in math proficiency. There has been an impact on students' social, emotional, and cognitive evolution, large numbers of dropouts from general education schools, significant lags in digital connectivity, online digital skills by businesses, and digital public services [28–30]. Addendum 1 to this document: all countries must dramatically improve their cognitive skills (literacy and numeracy) and problem-solving in technology-rich environments [37–41]. Students who might not otherwise be able to access knowledge can benefit from MOOCs, as can those who cannot pay the high prices of traditional higher education. In addition, MOOCs are a helpful form of online learning that may be used to supplement formal university education [37–41].

AI integration in schools, the workplace, and daily life will have a tremendous effect on our digital literacy abilities and our ability to improve our digital competencies. By monitoring speech and search habits and offering online resources to supplement their knowledge, this expansion of AI will assist more individuals in developing their digital literacy abilities. AI will accomplish this through its "ability to acquire and analyse contextual information" gleaned from our interactions with our devices [37–41].

3. SWOT Analysis

An INPUT SWOT analysis (available applications, practitioner capability, the client group, and its potential) shows over half of HR in Nordic countries have a Bachelor's degree in science, math, computing, engineering, manufacturing, or construction. The other countries have a large pool of creative and ICT industry talent. Still, they cannot turn this advantage into a facilitator of digital transformation for small and medium-sized businesses and the government sector. The gap between entrepreneurial transversal management skills and ICT and design skills needs to be filled by integrating these two disciplines better. In addition, good practices must be learned from countries that have already experimented with them [42,43].

Serbia is characterised by several belongings, such as entirely digitised corporate operations for companies in critical administrative centres, and employees are required to have varying levels of digital competence. Since 2013, the most significant degree of digital proficiency has tripled in demand. The struggle for Serbian digital enterprises is to broaden into the smaller and more inaccessible areas of the country. Developing people who can use digital technology creatively and respond to quickly changing needs is challenging. The state should facilitate the process of digitalisation through digitising public administration and the education system. An increasing number of students want to be skilled in the digital world in Serbia. Tough jobs such as administration, system administration, and project management demand more excellent digital expertise. Consumer digital competency is now moderate. In the coming months and years, the state should focus on the following areas: the management of personal data, digital payments and money, and digital consumer rights after purchase [44,45].

Romania has a relatively large pool of talents in the creative and ICT industries. However, there are also weaknesses in transforming this opportunity into a promoter of digital transformation for SMEs and the public sector. A better connection between entrepreneurial transversal managerial skills and disciplines with ICT and design skills is needed to fill the gap [46–48].

We based our research mostly on practical experience accumulated in USH Pro Business (www.ushprobusiness.ro, accessed on 28 March 2022), an entrepreneurial centre of the university dealing with complex interactions between academics, students, businesses, employers' associations, and business clusters in the last five years. This experience gave us a practical opportunity to explore an enhanced educational environment to learn how AI technologies can match, considering the prospective technological performance companies offer. Therefore, the main findings are based upon this interaction, enabling us to research how AI's best technological models with the business may be transferred to HEIs.

Thus, we support our research through the active involvement of USH Pro Business in specialised technology transfer services, information actions, and knowledge transfer from the university environment to the business environment in the area of digitalisation. As a result, Centrul became a member of the National Council for Digital Transformation (CNTD) within the Authority for the Digitization of Romania (ADR). CNTD, the advisory body of ADR, has the primary objective of supporting Romania's technological, economic, and social development. The membership status in CNTD was validated by the decision of the President of ADR, according to the provisions of GD 89/2020, art. 17, para. (6).

Moreover, USH Pro Business became a founding member of the DIH (digital innovation hub) structures, and is a founding member of Smart eHub (http://smartehub.eu/about-us/, accessed on 28 March 2022), the Smart Alliance Innovation Technology Cluster, and the ELINCLUS Cluster. A digital innovation consortium was created to offer organisations from the Bucharest–Ilfov and South Muntenia regions the possibility of accessing a one-stop shop, where they can obtain innovative digital solutions that meet their needs.

Through Smart eHub, USH Pro Business collaborates and works together with main actors, such as public authorities, the private business environment, universities, non-governmental organisations, research institutes, and companies in the ICT field, to find feasible solutions for transformation through digitalisation so that there is a relevant impact on the Romanian economy.

Through this DIH, the centre is also a member of the AgROBOfood Network of the Digital Innovation Hubs (DIHs) in Central and Eastern Europe, which supports companies in introducing and promoting new robotic technologies in the agri-food sector in the region, providing access to the expertise available from the European network (there are 49 DIHs, covering 19 member states).

PROCESS SWOT refers to needs assessment, action plan development, and collaboration with other organisations, process-engaged clients, and practical practitioners. High-performing states require a policy infrastructure that facilitates performance and sustains educators' capacity to implement it in educational institutions. Peer-to-peer learning is encouraged by professional learning communities and teacher networks. It is recommended to develop classroom-focused research to support educators to adapt to changing curricula, pedagogies, and digital resources [49,50].

In the new educational system, important issues to be addressed are ICT skills development for teachers, changing the mindset of the teachers and the HE manager, changing their vision, leadership, competence, and coherence, and extensively training the trainer campaigns for HEI staff. In addition, adult education is the focus of the cross-sectoral and inter-institutional dialogue [51,52] that addresses the issues regarding (1) increasing social partners' involvement and relevance, (2) the significance of the role played by the third sector, (3) favourable legal framework, and (4) labour market intelligence and the validity of the information.

OUTCOMES SWOT refers to changes in knowledge or transversal skills, changes in life and circumstances, changes in employment, or training status: it is essential to find a job or training program that matches your talents and aspirations, incorporating professionals from a variety of fields to create interdepartmental networks that emphasise entrepreneurship, information and communications technology (ICT), sustainability (reducing the environmental footprint), design, human health (including one-health), and the green economy. Boosting clusters of innovation and a cross-subject approach can be a good starting point for strengthening employment services that favour upskilling tailored to individual needs—e.g., using MOOCs and blockchain technology to create universities that do not have walls [53–57].

The ecological agronomy, innovation, cultural background, education, intelligent houses, smart cities and villages, etc., reduce environmental footprints and are among the interdisciplinarity clusters that the Romanian SWOT results reveal. In terms of interdisciplinarity, we have combined disciplines in creative industries, design, and management for the one-health food security fields [58–60]. Lessons learned from previous projects were included in the conception of a new course (CoP in new agro-ecology standards), and were used for the technology and knowledge transfer centre [61,62].

Serbia has the most significant outcomes in OECD studies for educational evaluation and assessment. Serbia's education system is superior to other Western Balkan countries. School access has improved. However, progress has not been uniform. Many Serbian students drop out of high school before mastering the core abilities required for future education. Many educational issues must be addressed if the country is to thrive economically, socially, and politically. Clusters of interdisciplinarity are being designed to focus on human well-being, one-health, and interdisciplinarity. Interdisciplinarity and a mental shift are required in Serbia. The fourth aim of the 2030 Agenda for Sustainable Development spotlights education: the eventual goal is to "promote lifelong learning and equal access to high-quality education" (2030). "Increase the number of children and adults with suitable transversal skills, including technical and vocational talents, especially workforce ones," says aim 4.4 [44].

4. Methodology

4.1. Research Aim and Survey

This research aims to discover the main difficulties and applications brought by AI technology in the current stage of the educational system in Romania and Serbia. We also analysed their utility in the educational system and the teacher's desire to implement them.

On this subject, we designed a survey that contains multiple-answer questions, and honest answers were analysed qualitatively. We chose the Likert scale for multiple-answer questions. The survey was applied among teachers at the Serbian High Vocational School for Information Technologies (Information Technology School—ITS Belgrade) and Romania at Spiru Haret University. It was based on other university experiences [44,63–65]. Unfortunately, from 139 answers, only 103 records (answers from HEI) were validated. Thus, this is preliminary research and, therefore, a more thorough study on a representative sample is necessary to conduct secondary research. For data analysis, we used SmartPLs Software version 3.0 (University of South Alabama, Mobile, AL, USA), making inferential and variable association analyses. We designed a confirmatory factor analysis (CFA) method to analyse the opportunities, challenges, and utilities. We measured the impact of each factor: opportunity challenges and utilities of implementing AI in HEIs. CFA allowed us to set up restrictions over the model, grouping survey questions into four variables (Table 1) and setting the direction of influence/relations between them. The main disadvantage of CFA is that it does not show the direction of influence. Still, it can measure the impact of each factor and subfactor and show if the model presents a good fit of data and is consistent. The model calculates the loading factors of each variable. This was the main reason we used the CFA and not a predictive analysis, such as a regression model [65,66].

The software will estimate the model saturation based on a series of indices that enhance how well the model explains the variables and fits the hypothesis established. In this regard, we can mention absolute indices, such as the statistic value of chi-square (that allows inferential statistics) or standardized root mean square residual (SRMR), and relative indices, such as the normed fit index (NFI), and comparative indices such as Akaike's information criterion (AIC) and the Bayesian information criterion (BIC) The relevance of the latent constructs designed was analysed with Cronbach's alpha test, and the consistency of the model was evaluated with composite reliability, rho_A, and average variance extracted (AVE). The model's multicollinearity was tested with the variance inflation factor (VIF) criterion [67,68].

Table 1. Variable analysed.

Var Label	Var Subitems	Variable Definition	LF
AIOpp	Opresent	Creating presentation and teaching material.	0.681
	Ocompetence	Selection of teaching material concerning the competencies and student's interests.	0.564
	Oplan	Creating individual learning plans for students.	0.537
	Orequire	Selection of teaching material in relation to the subject requirements.	0.5
	OFeedback	Providing feedback on student success.	0.488
	Olecture	Teaching (lectures).	0.475
	Oreview	Review of homework, tests, and other written assignments, monitoring student achievement, and providing feedback.	0.458
	OPlagiat	Detection of plagiarism in the student papers.	0.365
	Odificult	Detection of educational challenges and difficulties in acquiring knowledge among students.	0.347
	Oemotion	Detection of socio-emotional challenges and difficulties in acquiring knowledge among students.	0.23
	Odevelop	Detection the need for a professional development.	0.162
	Oadmin	Administrative jobs (creation of working reports and tasks).	0.112
Contribution	Implement	I would like to participate in the implementation and development of AI in my school.	1
AIChallenge	Cogn	Integrating cognitive projects with system and privacy issues.	0.574
	Cost	The cost of technology.	0.188
	Challenge	The crude nature of technology.	−0.034
	Digital	Digital illiteracy.	0.488
	Expert	The lack of AI technology experts.	0.471
	Strategy	The lack of an appropriate implementation strategy.	−0.072
AIutility	AIhelp	AI identifies students with low activity.	0.652
	AIwarn	AI prevents inappropriate learning of students' behaviours.	0.513
	AIperf	AI enforces student motivation and active presence in online activities.	0.86
	AIcustom	AI can tailor the learning process for different students.	0.775
	AIinsight	AI helps teacher correct and evaluate student performance.	0.712
	AIerr	AI can suggest appropriate teaching materials for students with a lack of knowledge.	0.52
	AIlect	AI facilitates the teacher's process of searching for lecture content.	0.718
	AIcont	AI facilitates time management when designing the teaching content.	0.881
	AIteacherr	AI reduces teachers' errors.	0.713
	AIteachacc	AI facilitates teachers' successful work.	0.978

4.2. Variables and Hypothesis

In our analysis, we set up four variables: AIopp (applications offered by AI in HEIs)—a formative variable with 12 items, AIChallenge (difficulties associated with AI in HEIs)—a constructive variable with six items, AIutility (HEI activities facilitated by AI)—an automatic variable with ten items, and Contribution (teacher desire for implementing AI in HEIs), a reflexive variable. All these items are presented in Figure 1 and Table 1.

The hypotheses of the research are:

H1: Activities performed with the AI tools are positively influenced by applications brought by the use of AI in HEIs.

H2: Activities performed with the AI tools are affected by difficulties associated with the help of AI in HEIs.

H3: Teachers' desire to implement AI in HEIs depends on the opportunities and challenges brought by AI.

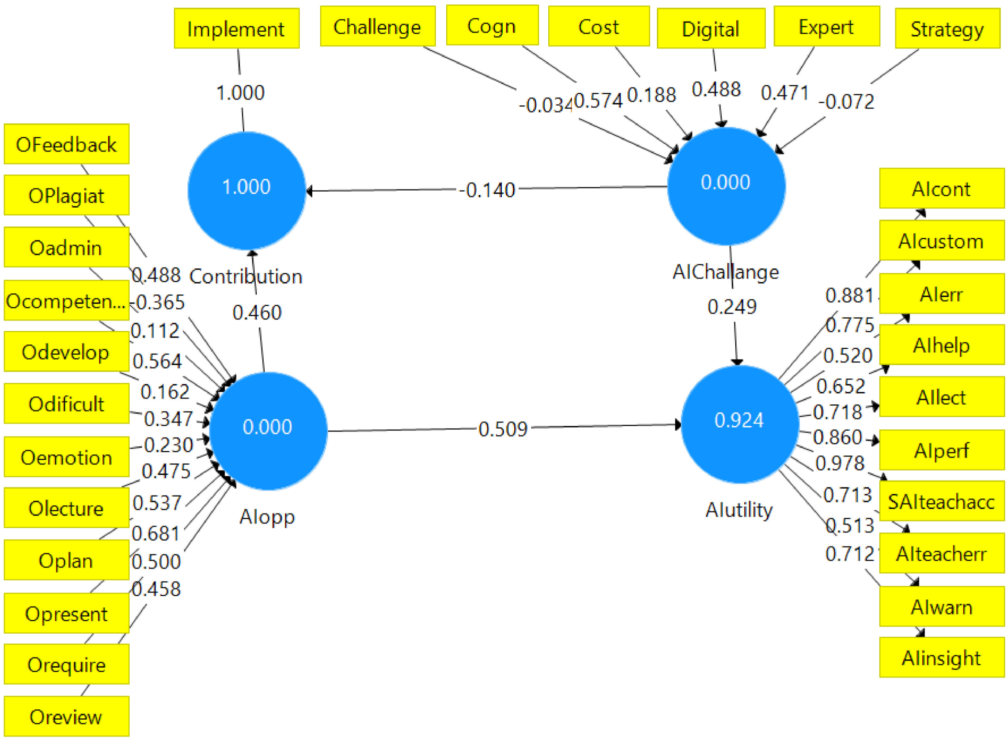

Figure 1. Cronbach's alpha coefficients and path analysis.

4.3. Research Results

4.3.1. Construct Reliability and Validity

SmartPls software provides many tests that can be used to ensure a coherent analysis and interpretation of data and to assume the research outputs. For example, the consistency of our model was grounded on the validation steps provided in Table 2 [66,67]. All the considered variables present very high values for composite reliability: Cronbach's alpha and rho_A (>0.7—the bottom value authorised), and average variance extracted (AVE) (>0.5—the bottom value approved), meaning that convergent validity can be assumed. These results empower us to believe that all our hypotheses are validated to different extents. (Table 2, Figure 1).

Table 2. Validation steps/tests.

Variable	Cronbach's Alpha	Rho_A	Composite Reliability	Average Variance Extracted
AIChallenge		1		
AIopp		1		
AIutility	0.928	0.938	0.924	0.556
Contribution	1	1	1	1

The loading factors (LFs) for latent constructs in Table 1 and Figure 1 enhance that, in the teacher's opinion, AI's implementation in HEIs is used with predilection for designing the course content (LF = 0.681), choosing the suitable teaching material following the students' interests and competencies (LF = 0.564), creating and adapting the learning plans for each student (LF = 0.537), choosing the excellent course sections' content following students' requirements (LF = 0.500), having good communication and providing feedback to students regarding the success of their task (LF = 0.488), teaching lectures (LF = 0.475), in the process of written homework and other tasks' evaluation (LF = 0.458), and the detection of plagiarism in student papers (LF = 0.365). AI has not been considered as an opportunity to detect socio-emotional issues and students' needs for professional guidance. The teachers seem uninterested in administrative tasks such as creating working reports and functions, probably because they are not asked to write them too often.

Our analysis emphasises that teachers consider that significant challenges of AI implementation in HEIs are integrating cognitive projects with system and privacy issues (LF = 0.574); teachers are not trained very well regarding digital issues and AI (LF = 0.488), and there are not enough AI technology experts to solve unexpected or critical problems caused by technology (LF = 0.471). Moreover, the teachers are not very aware or concerned about the cost of technology (LF = 0.188), its difficult nature (LF = −0.034), and inappropriate strategies for AI's implementation in HEIs (LF = −0.072).

Based on the opportunities and challenges presented above, the teachers consider that, overall, AI can help them to have success in professional activity (LF = 0.978), save time when planning the class content (LF = 0.881), improve student performance and engagement (LF = 0.86), and personalise the learning process by identifying the best way to teach materials (audio, video, e-book), which will significantly contribute to the quality of teaching (LF = 0.775). Teachers use AI in choosing materials for lecture content (LF = 0.718), making fewer mistakes (LF = 0.713), having better insight into student performance (LF = 0.712), identifying students at risk (LF = 0.652), analysing students' incorrect answers and suggesting which teaching units require additional instruction (LF = 0.52), and using the system to automatically provide warnings for students' risky behaviours (LF = 0.513).

Having all these elements in mind, the teachers agree to contribute to AI's implementation in HEIs. The Cronbach's alpha analysis shows that the questionnaire items were appropriate for our analysis, as the sub-items for the reflective variables AIutility (0.924) and Contribution (1) had values higher than 0.7, the bottom line, as shown in Figure 1 and Table 2.

4.3.2. Discriminant Validity

Our model is statistically robust, as the Fornell–Larcker criterion and heterotrait–monotrait criteria are met, because all values obtained are less than 0.70 (Table 3):

- AIChallenge→AIutility (0.253)—Challenges brought by AI implementations seem not to have a high impact on the activities' utility, performed by AI; rather, they have a positive effect, being considered an urging factor for digitalisation;
- AIopp→AIutility (0.511)—Opportunities brought by AI implementations have a positive impact on the activities' utility, performed by AI;
- AIChallenge→Contribution (−0.137)—Challenges associated with AI brings reticence in teachers' desire to implement AI in HEIs;
- AIopp→Contribution (0.459)—opportunities brought by AI enhance the teacher's willingness to implement AI in HEIs.

Table 3. Discriminant validity.

	Fornell–Larcker Criterion				**Heterotrait–Monotrait**
Variable	AIChallenge	AIopp	AIutility	AIChallenge	AIutility
AIChallenge					
AIopp	0.007				
AIutility	0.253	0.511	0.746		
Contribution	−0.137	0.459	0.409	01	0.414

The Fornell–Larcker criterion calculates the square root (SR) of each construct's AVE, checks if it is higher than its correlation with another construct, and checks if the loading factor is highest on its associated construct. It measures the variance among latent model constructs. It depends on AVE and CR. Heterotrait–monotrait is a new approach that evaluates discriminant validity as a measure of similarity between latent variables [67,68].

The steps presented in Tables 2–4 empower us to assume that the indicators of the constructs AIopp, AIutility, and AIChallenge present a positive correlation. As a result, a medium positive correlation (Table 4) is observed between AIopp and AIutility (0.511) and AIopp and Contribution (0.459), and a small one between AIutility and Contribution (0.409).

Table 4. Variable correlation.

	Latent Variable Correlation				R Square	R Square Adjusted	F Square	
Variable	**AIChallenge**	**AIopp**	**Aiutility**	**AIChallenge**			**AIutility**	**Contribution**
AIChallenge	1						0.092	0.025
AIopp	0.007	1			0.323	0.305	0.382	0.275
AIutility	0.253	0.511	1					
Contribution	−0.137	0.459	0.409	1	0.230	0.209		

The chi-square for the estimated model (609.569) is greater than the chi-square for the saturated model (603.029). Other hypothesis tests (SRMR, d_ULS, d_G) also have higher estimates for the estimated model than for the saturated model. Thus, we may affirm that our model fits, and that H1, H2, and H3 are accepted (Table 5). The standardised root mean square residual (SRMR) has a value of less than 0.1, explaining a good fit [65–68]. d_ULS represents the squared Euclidean distance, and d_G represents the geodesic distance used to compute discrepancy based on the eigenvalue. The normed fit index (NFI), or Bentler and Bonett index, is then defined as one minus the Chi^2. The more parameters in the model, the larger (i.e., better) the NFI result. Thus, our hypothesis is confirmed by a consistent model (Table 5). The software chooses the model in which the AIC has a minimum value.

Table 5. Model Fit.

Test	Fit Summary		Var	AIC	AICu	BIC
	Saturated Model	Estimated Model		−15.138	−12.078	64.417
Chi-Square	603.029	609.569		−25.030	−21.970	54.525
SRMR	0.087	0.9				
d_ULS	3.298	3.542				
d_G	1.630	1.645				

4.3.3. Collinearity Statistics VIF

The VIF of each construct was calculated to check the significance of variables. Table 6 show an overview of the findings. The values are less than 5 for each subitem. Thus, we may declare that the overall VIF shows no multicollinearity between variables. Therefore, we may guarantee that H1, H2, and H3 are accepted, based on the above criteria.

Table 6. VIF Coefficients.

Variable	VIF	Variable	VIF	Variable	VIF
OFeedback	2.409	AIhelp	3.308	Implement	1
Oreview		AIwarn	2.547	Cogn	1.693
OPlagiat	1.546	AIperf	3.953	Cost	2.034
Oadmin	1.426	AIcustom	2.979	Challenge	2.054
Odevelop	1.291	AIinsight	2.464	Digital	1.858
Ocompetence	3.064	AIerr	2.347	Expert	2.095
Orequire	1.868	AIlect	2.881	Strategy	1.863
Opresent	2.103	AIcont	3.131		
Odificult	1.812	AIteacherr	3.396		
Olecture	2.041	AIteachacc	4.253		
Oemotion	1.384				
Oplan	3.464				

5. Discussion

The study aims to evaluate the main difficulties and applications that AI technology brings to the educational system in Romania and Serbia at the current stage of their development. As a result, we devised a survey that included multiple-choice questions and open-ended responses that were analysed qualitatively. Keeping in mind previous research [63–65,68], the survey was administered to current teachers at Serbia's Information Technology School—ITS, Belgrade and Romania's Spiru Haret University. Unfortunately, only 139 of the responses were validated. Thus, this exploratory study will be repeated if the results conclude. Moreover, the results might not be extrapolated to the whole statistical population to conduct a more thorough representative sample analysis.

The development of innovative and transversal talents is necessary to foresee future inventions and the possibilities of new technologies. Therefore, ethics, values, problem-solving, and daily activities were at the forefront of education. In the future, students' learning content, how they might gain these more significant competencies, and what changes are required in education must be appropriately handled [44].

In this context, universities must develop new digital skills in IA, machine learning, IoT, 5G, the cloud, big data, blockchain, data analysis, using MS Office and other applications, MOOCs, simulation applications, VR/AR, and gamification. They must also build transversal transdisciplinary abilities and a sustainable mentality [13]. An example of using technology even in sport is offered by United States in the Oregon Project for measurements of the optimal intensity of athletes' heart, lung, brain, kidney, and liver values, etc. for athletes training [69].

HE aims to achieve sustainable learning outcomes and high-quality teaching and education, and to acquire appropriate competencies. The quality of education is evaluated using proper methods and methodologies. The inappropriate handling of funds and curricula was found, but interactivity with students was present; they were making learning easy and exciting with unique game applications. Providing a conducive learning environment increases student participation, creativity, and innovation. Education for a sustainable future will address present and future challenges. High-quality education may be implemented with blockchain and MOOCs. Using blockchain technology, individuals can earn discount vouchers for their actions. Vouchers can be exchanged for virtual money. This system will have high user commitment if the socio-psychological human needs are satisfied through face-to-face connection and psychological compensations. More study is needed to find creative solutions [70].

Internships, practical experience, simulations, and experiments conducted by practitioners outside the HEI, as well as degree theses elaborated in partnership with non-HEI organisations, may reflect the quality of education. In addition, student commitment and educational process outcomes are significant indicators for instruction endowment.

Artificial intelligence studies the construction of intelligent machines that act and think like humans—speech, NLP, picture, etc. ML uses AI to enable systems to learn and develop without explicit programming. In machine learning, for example, computers learn from data, not scripted instructions [34].

An AI system can provide forecasts, suggestions, or judgments in response to human-defined objectives. AI systems are designed to be semi-autonomous. AI tools in education help explain and teach. Global education spending on AI will hit USD 6 billion by 2025. Around half of international AI education funding will come from China.

Changing geopolitical powers, changing jobs, and a lack of educational applications due to new technologies such as AI and robotics or 5G requires a new mindset and educational methods, such as universities without walls, experimental problem solving, home education, and MOOCs under blockchain technology such as Tutellus [2,3].

The post-COVID-19 period has had serious consequences; in this period, low-income countries have lost 30% of their children's reading comprehension and 50% of their arithmetic performance, compared to high-income countries. Significant lags in digital connectivity, online digital skills by businesses, and digital public services [28–30] have also occurred.

A significant transformation is currently taking place in the education system in Serbia and Romania. Serbia announced several education reforms, guided by a solid commitment to EU integration. Nevertheless, international assessments show that students' learning outcomes in Serbia remained stable in recent years, with slight improvements among the highest-achieving students. This indicates widening educational disparities, and many students cannot demonstrate the essential competencies they will need to progress in their education and later in life [69,70]. Moreover, numerous socioeconomic groups and regions remain out of reach, which, in turn, impedes national progress. This study introduces Serbia and Romania's education systems. It offers details on how assessment and evaluation strategies in these countries' systems can propel the country towards higher learning outcomes. However, in these countries, the teachers are open to implementing AI technology to automate some of their teaching and evaluation activities, so as to have more time for interactive lessons and collaborative projects. Although the adoption of AI comes with some challenges and costs, the teachers consider that the opportunities brought by AI have already proved their utility in the HEI environment.

SmartPLs Software version 3.0 was used to perform inferential analysis and variable association analysis on the collected data.

In our analysis, we choose four variables: two formative ones, namely, AIopp (applications offered by AI in HEIs) and AIChallenge (difficulties associated with AI in HEIs), and two reflective ones, namely, AIutility (HEI activities facilitated by AI) and Contribution (teacher desire to implement AI in HEIs). All these variables are presented in Figure 1 and Table 1.

We were able to analyse and extrapolate the findings of our study using many tests offered by the SmartPls software. Table 2 shows the validation steps we took to ensure the model's consistency [66,67]. In terms of composite reliability (CR), Cronbach's alpha (CA), rho_A (all > 0.7, which is considered the bottom level of acceptability), and AVE, the variables examined have tremendous values (>0.5—the bottom level accepted). So, the convergent validity is proved by the AVE of the latent reflexive variables. Therefore, we can say that all our hypotheses have been validated to varying degrees. The conclusion of applying Cronbach's alpha analysis was that the variables' sub-items were appropriate for our research (being > 0,7). Therefore, our model is statistically powerful, as the Fornell–Larcker criterion met the heterotrait–monotrait standard (Table 3. The construct indicators AIopp, AIutility, and AIChallenge were positively correlated. The validation data support this. Our hypotheses H1, H2, and H3 can be accepted because the saturated model has higher values than the estimated model (Table 4). VIF was calculated for each construct. This study's findings are summarised in Table 5. All VIF values are less than the critical value (5), meaning no multicollinearity is manifested between variables.

H1: Activities performed with the AI tools are influenced by opportunitiesbrought by the use of AI in HEIs. Regarding opportunities brought by AI, the variables with higher loading factors and greater importance are: creating presentations and teaching materials (0.681); selecting teaching materials in relation to the competencies and students' interests (0.564); creating individual learning plans for students (0.537); selecting teaching materials with regard to the subject requirements (0.500); providing feedback on work for successful students (0.488); objective reviews and domestic evaluations, control, for written and other tasks (0.458); detecting plagiarism in the work of students (0.365); and detecting difficulty in the adoption of materials by students (0.347) [71–75].

H2: Activities performed with the AI tools are influenced by difficulties associated with AI use in HEIs. Regarding challenges related to AI implementation, the variables with higher loading factors and greater importance are: integrating cognitive projects with system and privacy issues is a significant challenge for AI (0.574), digital illiteracy is a big challenge for AI (0.488), and the lack of AI technology experts is a significant challenge for AI (0.471). These factors urge teachers to learn and acquire new transversal skills and knowledge in the AI field, positively influencing the HEI system. Although the cost of technology is relatively high, it seems to not be considered an obstacle (0.188). Nevertheless, a lack of an appropriate implementation strategies for AI is manifested (−0.072), as is the crude nature of technology (−0.03) [75–77].

H1 and H2 sustain the utility of AI in HEIs. Most of the variables that explain the AI utility in HEIs have loading factors and very high importance (>0.7). We may give some examples, such as that AI can improve student performance and engagement (0.860); AI will enable the personalisation of the learning process by identifying the best way to teach materials (audio, video, e-book), which will significantly contribute to the quality of teaching (0.775); AI could help me search for materials and content for my lectures more easily (0.718); AI can help me make fewer mistakes (0.713); and AI can enable the teacher to have a better insight into student performance (0.712). Other factors with medium importance are that AI can help keep students in the learning process by identifying students at risk (0.652); AI can analyse students' incorrect answers and suggest which teaching units require additional instruction (0.520); and AI will provide an early warning system for students' risky behaviours (0.513) [75,78–80].

H3: Teachers' desire to implement AI in HEIs depends on opportunities and challenges brought by AI. The path coefficient for AIopp→Contribution (0.469) and AI Challenge→ Contribution (−0140) shows that teachers agree to implement AI in HEIs, observing the opportunities, instead of the challenges, which are brought by AI [79,80].

6. Conclusions

The study's goal is to figure out how artificial intelligence (AI) might help or hinder the educational process in Romania and Serbia at present. Moreover, we looked at how they would fit into the educational system and whether or not teachers would be willing to use them.

The study aims to assess the key challenges and benefits that AI technology provides to the educational systems in Romania and Serbia at this point in their development. In our research, we used four variables: two formative ones, AIopp (AI applications in HEIs) and AIChallenge (AI challenges in HEIs), and two reflective ones, AIutility (AI activities in HEIs) and Contribution (teacher desire to implement AI in HEIs). Figure 1 and Table 1 show all of these characteristics.

We were able to analyse and generalise our study's findings. We may state that all of our theories have been validated to differing degrees: AIChallenge, AIopp, AIutility, and AIChallenge positively correlated to the construct indicators. The validation data support this. Because the saturated model has greater values than the estimated model, our hypotheses H1, H2, and H3 may be accepted. According to our findings, actions performed using AI tools are impacted by applications brought about by the usage of AI in HEIs. In terms of AI opportunities, the variables with higher loading factors and greater importance are creating presentations and teaching materials, selecting teaching material in relation to competencies and student interests, creating individual learning plans for students, selecting teaching materials with regard to subject requirements, providing feedback on work for successful students, objective reviews and domestic evaluations, and control.

We discovered that AI tool actions are impacted by the challenges connected with AI adoption at HEIs. Concerning AI implementation problems, the variables with more prominent loading factors and relevance include integrating cognitive initiatives with system and privacy problems, which is a fundamental barrier for AI, as is digital illiteracy. In addition, a fundamental barrier to AI is a scarcity of AI technology expertise. These elements appear to encourage professors to study and gain new cross-disciplinary skills and knowledge in AI, favourably affecting the HEI system. Although the technology is relatively expensive, this does not appear to be an impediment. However, a lack of a good AI deployment plan is evident, as is the rudimentary nature of technology [75–77].

H1 and H2 support the use of AI in HEIs. The majority of the variables that explain the AI utility in HEIs have very high loading factors and significance. We can give examples, such as that AI can improve student performance and engagement; AI will enable the personalisation of the learning process by identifying the best way to teach materials (audio, video, e-book), which will significantly contribute to the quality of teaching; AI could help me search for materials and content for my lectures more easily; AI can help me make fewer mistakes; and AI can provide the teacher with a better understanding of students' performance. Other factors of moderate importance include AI's ability to keep students engaged in the learning process by identifying students at risk, AI's ability to analyse students' incorrect answers and recommend which teaching units require additional instruction, and AI's ability to provide an early warning system for students' risky behaviours [75,78–80].

Our findings show that teachers' motivation to use AI in HEIs depends on the possibilities and problems presented by AI. Instructors agree to deploy AI in HEIs after viewing the opportunities, rather than the challenges, presented by AI [79–81].

7. Contributions to the Paper, Limitations, and Future Research Directions

Every study, including this one, has limitations. The limitations of this research stem from its social desirability and unanswered questions. Furthermore, future research should develop concrete proposals for the Serbian and Romanian educational systems. By developing potential future steps and obtaining directions and guidance for implementing new technologies in HEI, resolving potential issues in the implementation and acceptance of these technologies, great benefits will be maintained for those institutions. Digital technologies offer a wide range of possibilities and means to support education transformation, necessitating a holistic view of technology-based education, the required changes, and an understanding of its effects. This article will make unique contributions to the body of knowledge, and future theoretical and managerial implications are expected in case of replication of this research and others.

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References

1. PISA. OECD Country Note Serbia. 2019. Available online: https://www.oecd.org/pisa/publications/PISA2018_CN_SRB.pdf (accessed on 5 November 2021).
2. IDI1 International Development Institute. eQuality, Equity and Inclusion in Education: Post-Pandemic Response. 2021. Available online: http://idiworldwide.net (accessed on 10 January 2022).
3. IDI2 International Development Institute. Leadership Program for Education Authorities (LPEA)—Improving Learning Outcomes AT the School Level Post-Pandemic. 2021. Available online: http://idiworldwide.net (accessed on 10 January 2022).
4. United Nations. Millennium Development Goals (MDGs). Available online: http://www.un.org/millenniumgoals/ (accessed on 30 November 2021).

5. UNESCO. *Roadmap for Implementing the Global Action Programme on Education for Sustainable Development*; UNESCO: Paris, France, 2014. Available online: https://unesdoc.unesco.org/ark:/48223/pf0000230514 (accessed on 5 September 2020).
6. Li, Y.; Nishimura, N.; Yagami, H.; Park, H.-S. An Empirical Study on Online Learners' Continuance Intentions in China. *Sustainability* **2021**, *13*, 889. [CrossRef]
7. DESI. Monitoring the Digital Economy and Electronic Communications Services in the Western Balkans and Turkey. European Commission. Luxembourg: Publications Office of the European Union. 2019. Available online: https://www.rcc.int/files/user/docs/3%20-%20DESI%202019.pdf (accessed on 10 December 2021).
8. Isaac, O.; Aldholay, A.; Abdullah, Z.; Ramayah, T. Online learning usage within Yemeni higher education: The role of compatibility and task-technology fit as mediating variables in the IS success model. *Comput. Educ.* **2019**, *136*, 113–129. [CrossRef]
9. Ramírez-Montoya, M.; Andrade-Vargas, L.; Rivera-Rogel, D.; Portuguez-Castro, M. Trends for the Future of Education Programs for Professional Development. *Sustainability* **2021**, *13*, 7244. [CrossRef]
10. Erasmus+ Call, KA2, Strategic Partnerships in the Field of Education and Training. Available online: https://ec.europa.eu/programmes/erasmus-plus/opportunities/calls_en (accessed on 15 August 2021).
11. EC1. New Skills Agenda for Europe—EU Skills Profile Tool for Third Country Nationals. Available online: https://ec.europa.eu/social/main.jsp?catId=1412&langId=en2017 (accessed on 9 May 2021).
12. EC2. New Skills Agenda for Europe—Recommendation on Key Competences for Lifelong Learning 2018. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2018.189.01.0001.01.ENG (accessed on 9 May 2021).
13. Zamora-Polo, F.; Sánchez-Martín, J. Teaching for a Better World. Sustainability and Sustainable Development Goals in the Construction of a Change-Maker University. *Sustainability* **2019**, *11*, 4224. [CrossRef]
14. UNESCO. *ICT Competency Framework. United Nations Educational, Scientific and Cultural Organization*; UNESCO: Paris, France, 2018.
15. United Nations. Transforming Our world: The 2030 Agenda for Sustainable Development. 2015. Available online: http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E (accessed on 24 October 2018).
16. USAID. Final Report on the Digital Skills Studies in Serbia. Usaid Cooperation for Growth Project (Cfg). 2020. Available online: https://saradnja.rs/wp-content/uploads/2020/04/REPORT_DIGITAL-SKILLS-STUDY.pdf (accessed on 20 February 2022).
17. OECD. Education Working Papers. Available online: https://www.oecd-ilibrary.org/education/trustworthy-artificial-intelligence-ai-in-education_a6c90fa9-en;jsessionid=mhdmIAmvjEp7tIExFa-E339G.ip-10-240-5-73 (accessed on 3 August 2021).
18. Maghnouj, S.; Salinas, D.; Kitchen, H.; Guthrie, C.; Bethell, G.; Fordham, E. *OECD Reviews of Evaluation and Assessment in Education: Serbia. Paris: OECD Reviews of Evaluation and Assessment in Education*; OECD Publishing: Berlin, Germany, 2020. [CrossRef]
19. Vincent-Lancrin, S.; Van Der Vlies, R. *Trustworthy Artificial Intelligence (AI) in Education: Promises and Challenges*; OECD Education Working Papers, No. 218; OECD Publishing: Paris, France, 2020. [CrossRef]
20. Artificial Intelligence & Global Education Report. 2019. Available online: https://www.holoniq.com/notes/2019-artificial-intelligence-global-education-report/ (accessed on 20 February 2022).
21. WEF. *Global Competitiveness Report*; World Economic Forum: Geneva, Switzerland, 2019.
22. Euro Guidance. Guidance System in Serbia. 2020. Available online: https://www.euroguidance.eu/guidance-system-in-serbia (accessed on 20 February 2022).
23. IASA. Working paper, The Demography of Skills-Adjusted Human Capital. Laxenburg. 2020. Available online: http://pure.iiasa.ac.at/id/eprint/16477/1/WP-20-006.pdf (accessed on 20 February 2022).
24. Internet World Stats. World Internet Users Statistics and 2019 World Population Stats.2020. Available online: https://www.internetworldstats.com/stats.htm (accessed on 24 November 2020).
25. Pérez-Navío, E.; Ocaña-Moral, M.; Martínez-Serrano, M. University Graduate Students and Digital Competence: Are Future Secondary School Teachers Digitally Competent? *Sustainability* **2021**, *13*, 8519. [CrossRef]
26. Brey, P. Ethics of Emerging Technologies. In *Methods for the Ethics of Technology*; Hansson, S.O., Ed.; Rowman and Littlefield International: Lanham, MD, USA, 2017.
27. HLEG. Ethics Guidelines for Trustworthy AI. 2019. Available online: https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai (accessed on 19 October 2020).
28. Bozkurt, A.; Karadeniz, A.; Baneres, D.; Guerrero-Roldán, A.; Rodríguez, M. Artificial Intelligence and Reflections from Educational Landscape: A Review of AI Studies in Half a Century. *Sustainability* **2021**, *13*, 800. [CrossRef]
29. Wang, Y.; Hong, S.; Tai, C. China's Efforts to Lead the Way in AI Start in Its Classrooms. Wall Street J. 2019. Available online: https://www.wsj.com/articles/chinas-efforts-to-lead-the-way-in-ai-start-in-its-classrooms-11571958181 (accessed on 19 September 2021).
30. Ray, S.; Saeed, M. Applications of educational data mining and learning analytics tools in handling big data in higher education. In *Applications of Big Data Analytics*; Springer: Cham, Switzerland, 2018; pp. 135–160.
31. Lai, J.W.M.; Bower, M.; De Nobile, J.; Breyer, Y. What should we evaluate when we use technology in education? *J. Comput. Assist. Learn.* **2022**, *38*, 743–757. [CrossRef]
32. Hanson, J.; Robinson, D.; Codina, G. Supported internships as a vehicle for social inclusion. *Br. J. Learn. Disabil.* **2021**, *49*, 433–444. [CrossRef]
33. Waters, L. Searching for wellbeing in schools: A new framework to guide the science of positive education. *J. Educ. Psychol. Res.* **2019**, *1*, 1–8.

34. Saini, R.; Mussbacher, G.; Guo, J.L.; Kienzle, J. Teaching Modelling Literacy: An Artificial Intelligence Approach. In Proceedings of the ACM/IEEE 22ND International Conference on Model Driven Engineering Languages and Systems Companion (MODELS-C 2019), Munich, Germany, 15–20 September 2019; pp. 714–719. [CrossRef]
35. Senior, J.; Gyarmathy, E. *AI and Developing Human Intelligence Future Learning and Educational Innovation*; Routledge: New York, NY, USA, 2021.
36. Market insider. *Global Education Technology Market to Reach $341B by 2025*. Available online: https://markets.businessinsider.com/news/stocks/global-education-technology-market-to-reach-341b-by-2025-1027892295 (accessed on 3 August 2021).
37. Ranković, M.; Dedić, V.; Jovanović, M.; Petrović, D.; Ilić, M.P. Escape rooms in virtual reality, the concept and application in electronic business doing. *Indep. J. Manag. Prod.* **2020**, *11*, 1247–1261. [CrossRef]
38. Nikimaleki, M.; Rahimi, M. Effects of a collaborative AR -enhanced learning environment on learning gains and technology implementation beliefs: Evidence from a graduate teacher training course. *J. Comput. Assist. Learn.* **2022**, *38*, 758–769. [CrossRef]
39. Dieck, T.C.; Jung, T. *Augmented Reality and Virtual Reality, The Power of AR and VR for Business*; Springer Nature: Cham, Switzerland, 2019.
40. UNDP—United Nations Development Programme—Sustainable Development Goals (SDGs). Available online: https://www.undp.org/sustainable-development-goals (accessed on 10 December 2021).
41. Risien, J. Curators and sojourners in learning networks: Practices for transformation. *Eval. Program Plan.* **2019**, *73*, 71–79. [CrossRef] [PubMed]
42. Britt, B.C. From cooperation to competition: An interaction-based contingency theory of communities of practice. *J. Knowl. Manag.* **2021**, *25*, 1594–1618. [CrossRef]
43. Ilić, M.P.; Păun, D.; Šević, N.P.; Hadžić, A.; Jianu, A. Needs and Performance Analysis for Changes in Higher Education and Implementation of Artificial Intelligence, Machine Learning, and Extended Reality. *Educ. Sci.* **2021**, *11*, 568. [CrossRef]
44. Đorđević, B.; Ivanović-Đukić, M.; Lepojević, V.; Milanović, S. Job satisfaction and organizational citizenship behaviour of employees in companies in the Republic of Serbia. *Strat. Manag.* **2021**, *26*, 61–71. [CrossRef]
45. Glavan, I.R. A Framework for Integrating ICT in Romania's Creative Economy, VISION 2025: Education Excellence and Management of Innovations through Sustainable Economic Competitive Advantage. In Proceedings of the 34th International-Business-Information-Management-Association (IBIMA) Conference, Madrid, Spain, 13–14 November 2019; pp. 11281–11290.
46. Herman, E. The Influence of ICT Sector on the Romanian Labour Market in the European Context. *Procedia Manuf.* **2020**, *46*, 344–351. [CrossRef]
47. Fan, P.; Urs, N.; Hamlin, R.E. Rising innovative city-regions in a transitional economy: A case study of ICT industry in Cluj-Napoca, Romania. *Technol. Soc.* **2019**, *58*, 101139. [CrossRef]
48. Darbi, W.P.K.; Knott, P. Strategising practices in an informal economy setting: A case of strategic networking. *Eur. Manag. J.* **2016**, *34*, 400–413. [CrossRef]
49. Silaeva, A.A.; Panova, A.G.; Evreeva, O.A.; Lobazova, O.F.; Azmetova, R. Designing a Distance Learning Process: The Use of Cloud Services for Peer-to-Peer Interaction. *Rev. Incl.* **2020**, *7*, 13–525.
50. Ye, D.; Pennisi, S. Analysing interactions in online discussions through social network analysis. *J. Comput. Assist. Learn.* **2022**, *38*, 784–796. [CrossRef]
51. Lanke, P.; Nath, P. Job switching and communities of practice: Mapping facilitators and dampeners to life cycle. *VINE J. Inf. Knowl. Manag. Syst.* **2021**. [CrossRef]
52. Bittencourt, B.A.; Galuk, M.B.; Daniel, V.M.; Zen, A.C. Cluster Innovation Capability: A Systemic Review. *Int. J. Innov.* **2019**, *7*, 26–44. [CrossRef]
53. McPhillips, M. Innovation by proxy—clusters as ecosystems facilitating open innovation. *J. Entrep. Manag. Innov.* **2020**, *16*, 101–128. [CrossRef]
54. Chandrashekar, D.; Subrahmanya, M.H.B. Exploring the factors of cluster linkages that influence innovation performance of firms in a cluster. *Econ. Innov. New Technol.* **2019**, *28*, 1–22. [CrossRef]
55. Hnatenko, I.; Kuksa, I.; Shtuler, I.; Orlova-Kurilova, O.; Rubezhanska, V. Innovation Cluster as a Mechanism for Ensuring the Enterprises Interaction in the Innovation Sphere. Manag. *Theory Stud. Rural Bus. Infrastruct. Dev.* **2020**, *41*, 487–500. [CrossRef]
56. Barasheva, E.; Zedgenizova, I. Interaction of Innovation Clusters, Science and Education. In *Social and Cultural Transformations in the Context of Modern Globalism. Proceedings of the Social and Cultural Transformations in the Context of Modern Globalism (SCTCMG 2019), Moscow, Russia, 1–3 November 2019*; Russian Academy of Sciences, Groznyi: Moscow, Russia, 2019; Volume 58, pp. 869–874. [CrossRef]
57. Rizzo, D.M.; Lichtveld, M.; Mazet, J.A.K.; Togami, E.; Miller, S.A. Plant health and its effects on food safety and security in a One Health framework: Four case studies. *One Heal. Outlook* **2021**, *3*, 6. [CrossRef]
58. Shariff, M. Food safety: A linchpin of One Health. *Rev. Sci. Tech. OIE* **2019**, *38*, 123–133. [CrossRef]
59. Sinclair, J. Importance of a One Health approach in advancing global health security and the Sustainable Development Goals. *Rev. Sci. Tech. OIE* **2019**, *38*, 145–154. [CrossRef]
60. USH Pro Business is a Specialised Center for Activities Dedicated to the Entrepreneurial Environment, Being Designed to Support Companies and Provide Solutions to Support Competitiveness in All Life Cycles of the Enterprise. USH, Pro Business. 2021. Available online: https://ushprobusiness.ro/en/home/ (accessed on 20 February 2022).

61. Ropero, R.; Maldonado, A.; Uusitalo, L.; Salmerón, A.; Rumí, R.; Aguilera, P. A Soft Clustering Approach to Detect Socio-Ecological Landscape Boundaries Using Bayesian Networks. *Agronomy* **2021**, *11*, 740. [CrossRef]
62. Ganz, N.; Lecon, C. Opportunities and challanges for XR techniques in Higher Education. In Proceedings of the 12th International Conference on Education and New Learning Technologies, Online Conference, 6–7 July 2020; pp. 481–490. Available online: https://library.iated.org/view/GANZ2020OPP (accessed on 3 August 2021). [CrossRef]
63. Yale University. Extended Reality in Higher Education: An Agenda for Action. 2020. Available online: https://blendedreality.yale.edu/2020/06/05/extended-reality-in-higher-education-an-agenda-for-action/ (accessed on 3 August 2021).
64. University of Waterloo, Centre for Extended Learning Open Resource Repository. Extended Reality (XR). Available online: https://contensis.uwaterloo.ca/sites/open/resources/CEL-ORR/toc/modules/extended-reality.aspx (accessed on 3 August 2021).
65. Vinzi, V.E.; Chin, W.W.; Henseler, J.; Wang, H. Handbook of Partial Least Squares. In *Handbook of Partial Least Squares*; Springer: Berlin/Heidelberg, Germany, 2010.
66. Hair, J.F.; Hult, G.T.M.; Ringle, C.M.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 3rd ed.; Sage: Thousand Oaks, CA, USA, 2022.
67. Henseler, J.; Dijkstra, T.K.; Sarstedt, M.; Ringle, C.M.; Diamantopoulos, A.; Straub, D.W.; Ketchen, D.J.; Hair, J.F.; Hult, G.T.M.; Calantone, R.J. Common Beliefs and Reality about Partial Least Squares: Comments on Rönkkö & Evermann. *Organ. Res. Methods* **2014**, *17*, 182–209.
68. Hooper, D.; Coughlan, J.; Mullen, M.R. Structural Equation Modelling: Guidelines for Determining Model Fit. *Electron. J. Bus. Res. Methods* **2008**, *6*, 53–60.
69. Popa, D.; Mîndrescu, V.; Iconomescu, T.-M.; Talaghir, L.-G. Mindfulness and Self-Regulation Strategies Predict Performance of Romanian Handball Players. *Sustainability* **2020**, *12*, 3667. [CrossRef]
70. Uyar, Y.; Gentile, A.; Uyar, H.; Erdeveciler, Ö.; Sunay, H.; Mîndrescu, V.; Mujkic, D.; Bianco, A. Competition, Gender Equality, and Doping in Sports in the Red Queen Effect Perspective. *Sustainability* **2022**, *14*, 2490. [CrossRef]
71. Bucea-Manea-Țoniş, R.; Bucea-Manea-Țoniş, R.; Simion, V.E.; Ilic, D.; Braicu, C.; Manea, N. Sustainability in Higher Education: The Relationship between Work–Life Balance and XR E-Learning Facilities. *Sustainability* **2020**, *12*, 5872. [CrossRef]
72. Brudermann, T.; Aschemann, R.; Füllsack, M.; Posch, A. Education for Sustainable Development 4.0: Lessons Learned from the University of Graz, Austria. *Sustainability* **2019**, *11*, 2347. [CrossRef]
73. Cabero-Almenara, J.; Barroso-Osuna, J.; Llorente-Cejudo, C.; del Mar Fernández Martínez, M. Educational Uses of Augmented Reality (AR): Experiences in Educational Science. *Sustainability* **2019**, *11*, 4990. [CrossRef]
74. Kantsedal, N.; Ponomarenko, O.; Dorohan'-Pisarenko, L.; Liaska, O. The methods of using interactive technologies during teaching foundations of scientific research at higher educational establishments. *Indep. J. Manag. Prod.* **2019**, *10*, 778–797. [CrossRef]
75. Lianu, C.; Radulescu, I.G.; Gudei, S.C.D.; Lianu, C.; Mindrescu, V. Cohesion Forces Determinants in Cluster Development: A Study Case for Romania. *Sustainability* **2022**, *14*, 3359. [CrossRef]
76. Alonso, R.S.; Prieto, J.; García, Ó.; Corchado, J.M. Collaborative learning via social computing. *Front. Inf. Technol. Electron. Eng.* **2019**, *20*, 265–282. [CrossRef]
77. Mahmud, S.N.D.; Husnin, H.; Soh, T.M.T. Teaching Presence in Online Gamified Education for Sustainability Learning. *Sustainability* **2020**, *12*, 3801. [CrossRef]
78. Marujo, H.; Casais, M. Educating for Public Happiness and Global Peace: Contributions from a Portuguese UNESCO Chair towards the Sustainable Development Goals. *Sustainability* **2021**, *13*, 9418. [CrossRef]
79. Kuleto, V.; Ilić, M.; Dumangiu, M.; Ranković, M.; Martins, O.M.D.; Păun, D.; Mihoreanu, L. Exploring Opportunities and Challenges of Artificial Intelligence and Machine Learning in Higher Education Institutions. *Sustainability* **2021**, *13*, 10424. [CrossRef]
80. Kuleto, V.; Ilić P., M.; Stanescu, M.; Ranković, M.; Šević, N.P.; Păun, D.; Teodorescu, S. Extended Reality in Higher Education, a Responsible Innovation Approach for Generation Y and Generation Z. *Sustainability* **2021**, *13*, 11814. [CrossRef]
81. Kuleto, V.; Ilić, M.; Dedić, V.; Raketić, K. Application of Artificial Intelligence and Machine Learning in Higher Education, Available Platforms and Examining Students' Awareness. *EdTech J.* **2021**, *1*, 24–28. [CrossRef]