EUROPEAN UNIVERSITY INITIATIVE IN THE CONTEXT OF DIGITAL TRANSFORMATION: A DISCUSSION PAPER

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ABSTRACT: The digital transformation (DT) has undoubtedly become one of the main challenges of modern organisations, including universities. The discussion is oriented towards the new learning tools, contexts, needs and skills needed on the institutional level, academic teachers and in connection to the demands of the labour market. This paper does not refer to potential ethical and safety risks but rather tries to understand how universities should approach those challenges from the perspective of their key missions, including education as a top priority. To do that, we use the example of the concept of the European University Initiative (EUI) case, as it has become one of the flagship programmes of the European Commission supporting the European Higher Education Area (EHEA) and European Research Area (ERA). With the purpose to build inter-university campuses, joint degree programmes, support seamless mobility, strengthen socially relevant research, promote sustainability etc., they also have become the lighthouses of the green and digital transformations. In this paper we aim to start a discussion about what digital transformation means in the context of teaching and try to define the most urgent questions that will help to define the future university model responding to the dynamically changing learning context.

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Introduction

The concept of the European University Initiative (EUI) originates from Emanuel Macron's speech at the Sorbonne University in Paris in 2017, and was rapidly endorsed by the European Commission that up to August 2024 supported 64 alliances in 35 countries, over 500 universities in total. As stressed by Cino Pagliarello (2022): "EUI represent a new hybrid type of collaboration based on transnational alliances among European universities – that can represent a game-changer for European higher education due to its innovative policy design. On the one hand, the EUI incorporates the aims of the European Higher Education Area (EHEA) and the European Research Area (ERA) into a common European dimension by linking education, research, and innovation within a common transnational approach. On the other, the EUI seems to exhibit a strong ideational coherence, political commitment, and a hybrid type of governance combining a European top-down dimension, under the policy coordination of the

European Commission, and a bottom-up one, which includes a multi-actor governance. In the case of Poland, there are 32 higher education institutions (HEIs) that are part of 30 alliances of European Universities.

The idea of university alliances, networks, groups etc., is not new, however the EUI represents a different and a very ambitious architecture in the EHEA and ERA. The EUI links research, education, innovation, competitiveness and society at large. One of its hallmarks is the seamless mobility across partner institutions, developing joint and flexible curricula and addressed both to students, academics and administrative staff. The governance is dual: top-down and bottom-up. The European Commission is in charge of the monitoring and review of the alliances, while embedding the alliances within an ideational discourse that makes an appeal to their role in fostering common values and European identity. At the bottom-up level, each alliance has established a governing body composed by multiple actors, ranging from private to public stakeholders, civil society organisations, and local actors (Cino Pagliarello 2022). Therefore, this makes the governance system of the EUI a promising flexible way of cooperation, in which national and transnational actors are simultaneously recipients and agents of change. They are recipients in the sense that the Commission provides capacity building, joint cooperation, and incentives; as agents, they take ownership of their own alliances by pursuing their policy agendas according to their (trans-)national institutional context. The EUI adds on to the Bologna process the focus on capacity building by integrating stakeholders in an international exchange and developing common solutions to common problems. It has a clear aim to support the European labour market through various tools and cross-border cooperation such as micro-credentials, investment in innovation, research excellence, cooperation with employers, sustainability and digitalisation. What is shared by all the alliances is the promotion of European values, including democracy, human rights, multilingualism, peace, just to name a few. In other words, we can call the EUI as a game changer in the EHEA and ERA.

In January 2022, European Commission issued Communication on a 'European Strategy for Universities' focused on present challenges and visions for the EHEA and ERA. Digital transformation (DT) is present there as one of the main priorities. The relevance of this topic is supported by different financial and strategic mechanisms that EC intends to invest in DT, like Horizon Europe, Erasmus+, Digital Education Action Plan, Digital Europe Programme or European Open Science Cloud. It stresses that:

"The digital transition gives universities a fundamental role in equipping students and researchers with the digital skills and competences needed in the new reality and in the promotion of innovation and new technologies. During the COVID-19 pandemic, the higher education sector showed its ability to adapt to the new situation. It became evident that digital solutions cannot and should not fully replace physical activities. The future should be based on hybrid solutions representing a good balance between physical presence and digital tools. (…) Universities have a key role to play in fostering a labour force equipped to take on the challenges of the digital transition in the future. Specialised education offer in digital areas, such as AI, cybersecurity or cloud computing, as well as microelectronics, are crucial in this respect. Skill shortages in science, technology, engineering and mathematics (STEM) are one of the main obstacles. As digital technologies penetrate all sectors of the economy, it is also necessary that all students, for example those studying medicine, business administration and agriculture learn to use them at an advanced level in their professions"[1].

In our previous joint papers (Carayannis, Morawska 2023a,b, Carayannis, Morawska-Jancelewicz 2022) we concentrated on theoretical considerations regarding the role of higher education in regional innovation systems concentrating on supporting (digital) social innovation (DSI), human-centric innovation, transformative innovation or habitat innovation, as those driving towards digital and green transformations. Those considerations were embodied within quadruple/quintuple helix model of innovation and the concept of Society 5.0. Our theoretical investigations lead to the model of socially and digitally engaged universities that embrace

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[1]   https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A52022DC0016 (accessed 30 September 2024).

new university roles in the ecosystem of innovation, understood as a multilayer framework in which institutions interconnect to develop and share information and knowledge required for the development of new innovation processes (Carayannis, Morawska-Jancelewicz 2022). We also agreed with Hamaguchi 2020 that: "In designing this transformation, universities can function as core bases of value creation, and become places where transformation is prototyped with the cooperation of multiple stakeholders". One of our key statement, was that "As we move toward a truly people-centric life, progress in information technology must be accompanied by efforts to train up industrial innovators and raise the information literacy of each and every citizen. Universities, for their part, in addition to spurring technological progress as before, must additionally be responsible for cultivating literacy among information users through both general curricula and recurrent education, so as to promote the civil society that embodies Society 5.0" (Deguchi et al. 2018, Carayannis, Morawska-Jancelewicz 2022, Carayannis, Morawska 2023a,b).

The question still remains how to adapt, develop, adjust and support DT. In this paper we focus on practical aspects of DT related to skills and competences of academic teachers and students or to be more precise on digital literacy of academic community. We aim to start a discussion about what digital transformation means in the context of teaching and try to define the most urgent questions that will help to define the future university model responding to the dynamically changing learning context. DT is a multi-dimensional and multi-layered process but we believe that this 'human' component is crucial not only for making progress in DT but also for safety reasons and preventing miss-use and misunderstanding what is named digital technologies, including Artificial Intelligence (AI), Internet of Things (IoT), robotics, cloud computing, machine learning etc.

For purposes of this paper we mainly use the detailed desk research analysis that covered the available electronic material and university Internet resources, including annual reports, development strategies, as well as EU policy papers or Eurostat survey results. The organisation of this paper is designed in the following way. The next section focuses on understanding DT of universities. As a case study we chose the European University Alliance University of the Seas (SEA-EU) with the aim to analyse its mission and operative tasks related to DT and how it aims to incorporate it into its core education mission. The conclusions drawn therefrom may add value to the ongoing scientific discourse on the development of novel and innovative learning and teaching tools, pedagogies by universities and their importance for the innovative growth of regions, strengthening social and human capital within Society 5.0.

Understanding digital transformation

After Rêgo et al. (2021), we may claim that DT attempts to measure the extent to which an organisation, here university, is able to benefit from the use of information technologies (IT), but it is also seen as an evolutionary process through which IT becomes a fundamental element of its daily operations, affecting both people and organisation itself (Rodríguez-Abitia, Bribiesca-Correa 2021). There is no one-size-fits-for-all model as DT is dependent on the context, size, location, cultural organisation and regional embeddedness (Carayannis, Morawska 2023a,b, Sułkowski et al. 2021, Vishnevsky et al. 2021). AI can be both enablers and threats to organisations so universities should find their own ways to successfully implement and manage their transition towards desired futures (Carayannis, Morawska 2023a). In the university context those advantages can be seen as, e.g., personalised learning or influencing the *portoflio* of courses, developing microcredentials systems, whereas threats are related to ethical challenges like plagiarism, larger exclusion of those who lack digital literacy or even stable and cheap access to Internet. "For this reason, DT requires a change of focus and involves innovating in technology and modifying the institutional culture to guarantee the evolution of DT" (Abad-Segura et al. 2020: 5). This is also true for universities.

It is commonly agreed that digital technology plays a central role in the (re)construction of higher education identity on different levels: both individual (students, teaching and non-teaching staff) and institutional (Sá, Serpa 2022, Serpa, Ferreira 2019). In the concept of Society 5.0, this

understanding is clearly visible in addressing various social challenges with the use of AI and other digital tools and infrastructures. Therefore, the digital literacy seems to be the fundamental pillar of future producers, consumers or pro-sumers of digital solutions serving the needs of different actors and communities. Thus, universities need to transform their educational strategies and practices "at all levels of their operation, involving, new pedagogical approaches that foster, in addition to formal learning, also non-formal and informal learning, placing specific emphasis on the development of transversal competences and the flexibility of the curriculum, favouring a teaching-learning process that places students at its centre and ascribes them a more active role, through the use of new technologies and forms of assessment" (Sá, Serpa 2022).

This broad and challenging context is included, *inter alios*, in the European Framework for the Digital Competence of Educators (DigCompEdu), that is "a scientifically sound framework describing what it means for educators to be digitally competent". It provides a general reference frame to support the development of educator-specific digital competences in Europe. This framework is based on work carried out by the European Commission's Joint Research Centre (JRC), on behalf of the Directorate-General for Education, Youth, Sport and Culture (DG EAC)[2]. It describes 22 competences in six areas: 1. Professional engagement 2. Digital resources 3. Teaching and learning 4. Assessment 5. Empowering learners 6. Facilitating learners' digital competence (Table 1). This document is linked to the Digital Education Action Plan (DEAP, 2021–2027) (Table 2), developed and based on the social consultations that attracted more than 2700 respondents from 60 countries. According to DEAP: almost 60% of respondents had not used distance and online learning before the crisis; 62% of respondents felt that they had improved their digital skills during the crisis. More than 50% of respondents planned to take action to further enhance their digital skills, and 95% of respondents consider that the coronavirus crisis marks a turning point for how digital technology is used in education and training. Despite the fact that the COVID-19 crisis led to an unprecedented shift to online learning and digital technologies, more than one in five young people fail to reach a basic level of digital skills

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[2]   DigCompEdu – European Commission (europa.eu) (accessed 5 October 2024).

Table 1. Digital Competence Framework 2.0 based on DigComp.

Key components	Summary
Information and data literacy	– to articulate information needs, to locate and retrieve digital data, information and content; – to judge the relevance of the source and its content; – to store, manage, and organise digital data, information and content
Communication and collaboration	– to interact, communicate and collaborate through digital technologies while being aware of cultural and generational diversity; – to participate in society through public and private digital services and participatory citizenship; – to manage one's digital identity and reputation
Digital content creation	– to create and edit digital content; – to improve and integrate information and content into an existing body of knowledge while understanding how copyright and licences are to be applied; – to know how to give understandable instructions for a computer system
Safety	– to protect devices, content, personal data and privacy in digital environments; – to protect physical and psychological health, and to be aware of digital technologies for social well-being and social inclusion; – to be aware of the environmental impact of digital technologies and their use
Problem solving	– to identify needs and problems, and to resolve conceptual problems and problem situations in digital environments; – to use digital tools to innovate processes and products; – to keep up-to-date with the digital evolution

across the EU. Only 39% of teachers in the EU feel well prepared for using digital technologies in their daily work[3]. Access to broadband Internet varies significantly across the EU, ranging from 74% of households in the lowest-income quartile to 97% in the highest-income quartile[4].

In the context of the EUI "The utilisation and integration of digital technologies enable universities to go beyond their conventional virtual borders, influencing the portfolio of courses, regulating the delivery model and the entire value chain of a university" (Hashim et al. 2021). In other words, the process of DT at universities is conceived as a complex and interconnected environment that enables digital learning (Abad-Segura et al. 2020). The physical auditorium or classroom are no longer prerequisites for higher education, as learning can now occur online. Even in physical settings, virtual spaces complement the learning experience through applications like learning management systems and collaboration tools, enabling education to transcend geographical boundaries. The way we learn is increasingly shaped by the virtual world of the Internet, which connects us and provides access to vast stores of information. Digital technology can help in making education more inclusive

through accessibility software, it can offer learning opportunities for remotely situated students, and make research available to all through open publishing. However, it is worth noting that technology can also exacerbate global disparities, especially in terms of Internet access and computing power between the Global North and South. In this changing educational landscape, educators require the essential skills and competencies to navigate the digital realm effectively. Educational institutions need academic staff who can not only adapt to this evolving landscape but also design for more flexible education and lifelong learning.

The well-developed virtual learning landscape was a lifesaver when COVID-19 caused an unpreceded disruption to education. The pandemic forced us to reconsider long-held assumptions and traditional ways of doing things. Academic research on the pandemic's impact on higher education began sparking discussions about the post-pandemic future of universities. During the initial phase of the pandemic, educators resorted to "Emergency Remote Teaching", a term coined by Hodges et al. 2020 to describe hastily implemented online instruction that deviated from well-designed online teaching. The authors were worried that the "hurried moves online … could seal the perception of online learning as a weak option". The consequence could in the end be more scepticism toward online teaching. Other studies showed that Covid-19 was an accelerator for digitalisation of teaching (Skulmowski, Rey 2020). But it is less certain whether COVID-19

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[3]　OECD (2019), TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners, TALIS. Paris: OECD Publishing (After Digital Education Action Plan 2021–2027).

[4]　Eurostat (2019). Survey on ICT usage in households and by individuals (after Digital Education Action Plan 2021–2027).

Table 2. The Digital Education Action Plan strategic priorities based on the Digital Education Action Plan (2021–2027).

To foster a high-performing digital education ecosystem we need:	To enhance digital skills and competences for the digital age we need to:
infrastructure, connectivity and digital equipment	support the provision of basic digital skills and competences from an early age: – digital literacy, including management of information overload and recognising disinformation – computing education – good knowledge and understanding of data-intensive technologies, such as AI
effective digital capacity planning and development, including effective and up-to-date organisational capabilities	boost advanced digital skills: increasing the number of digital specialists and girls and women in digital studies and careers
digitally-competent and confident educators and education & training staff	
high-quality content, user-friendly tools and secure platforms, respecting privacy and ethical standards	

has radically reshaped our world as was the wish of H. E. Ms Sahle-Work Zewde, who chaired the International Commission on the Futures of Education and investigated the fate of education in a post-COVID world.

The European University Association Trends 2024 report (EUA 2024) confirms that the Covid-19 pandemic tested and challenged existing practices, yet at the same time provided invaluable opportunities to mainstream the use of digital tools and digitally enhanced teaching practices. Digitalisation is also one of the top five issues that have impacted institutional strategies since 2018. Digital preparedness has improved. However, while most institutions have policies in place for ethics, for integrity and data protection, and for enabling access for disabled students (all at over 90% of HEIs), digital resources and infrastructure appear to have received less attention. Institutional attention on artificial intelligence and blockchain is slightly less in evidence: full institution-wide approaches are not yet widespread. Almost all institutions have implemented policies, either fully or to some extent, in ethics and integrity (97%), data protection (95%), detection and prevention of plagiarism (94%), and intellectual property rights (91%). This seems to have been a priority for the institutions, due to technical, legal and reputational risks and pressures, and probably also to increased system-level policy attention. "By contrast, policies on digital equipment and infrastructures, although a high priority for institutions, have been implemented less systematically: 60% of HEIs have completed full implementation and another 33% have done so to some extent. (…) The fact that blended and hybrid approaches also require transformation of physical infrastructure is an additional hurdle from a financial and learning design perspective" (EUA 2024). In 2020, the Covid-19 pandemic caused major disruption for HEIs and most, if not all, shifted to online teaching. "But the pandemic was also a driver for change, and became an opportunity to live-test digitally enhanced provision and related tools, as well as to explore a better integration of blended and asynchronous study and teaching modes. All of this was not new to higher education learning and teaching, but it had never been employed in such a mainstreamed fashion" (EUA 2024).

SEA-EU Alliance case study

The European University of the Seas (SEA-EU) is one of the 17 alliances selected in the European Universities programme in its first call in 2019. Within four years since the pilot funding, the alliance made considerable progress in the connection and interactions between the six founding universities: University of Cádiz (UCA, Spain), University of Western Brittany (UBO, Brest, France), Kiel University (CAU, Germany), University of Gdańsk (UG, Poland), University of Split (UNIST, Croatia) and University of Malta (UM, Malta). In the second phase of funding, starting in the late 2023, the consortium expanded and three new entities joined SEA-EU: Parthenope University of Naples (UPN, Italy), the University of Algarve (UAlg, Portugal) and Nord University (NORD, Norway). SEA-EU is one of the few thematic alliances of European Universities, the unifying element in this case being the link of our community to the sea. Although the commitment is to link the Universities participating in SEA-EU from a global perspective taking into consideration their internal diversity, the fact is that we are all coastal universities, with marine and maritime studies as a sign of identity both from a research and teaching perspective. The marine-maritime mission is a hallmark of the SEA-EU universities and has also been the main unifying element in many of the activities that have been initiated during the SEA-EU pilot period aiming "to actively motivate all institutional partners to build SEA-EU, inspiring global thinking and transforming our daily actions, and our relations with the seas. This will be the way of answering societal challenges and achieving protection of life under and above water in the Global Ocean, with positive global impacts on planet Earth" (SEA-EU Mission Statement 2022).

Four priorities are selected as relevant for the SEA-EU alliance: a European Green Deal, a Europe fit for the digital age, promoting our European way of life and an economy that works for the people. In its Mission Statement the Alliance claims that: "SEA-EU supports a healthy society that pursues European democracy, wellbeing and competitiveness, empowering our universities as actors of change in the twin Green and Digital transition (…) and then: We will develop innovative pedagogies and promote

the latest digital technologies in order to deliver personalised content, enable sharing and promote open science. This will result in good practices which will, from the start, embed adaptability to different regions in Europe and beyond Europe". The SEA-EU alliance targets three key levels in the work to contribute to these priorities: partner universities and the Alliance, individuals (including students, staff and citizens), and European education and research areas, as well as international cooperation. The SEA-EU aims to create conditions that enhance integration among alliance universities, provide personalised skill-based curricula, facilitate diverse mobility opportunities for students and staff, promote research-based education, prioritise inclusion, support open educational resources and open science, and ensure the long-term sustainability of the alliance. These aspirations should be viewed within the international context provided by the SEA-EU Alliance, which promotes sustainable cooperation at different organisational levels, while also acknowledging and respecting the unique cultural and linguistic identities of each university. In the pilot phase a wider perspective of training has led to the implementation of digital teaching initiatives. Thus, the SEA-EU Alliance completed the Massive Open Online Courses (MOOC) series on 'Sustainable use of the Ocean', with also a digital oceanographic campaign experience (digiCruise), and a course to improve digital teaching skills (digiTeachKit). Moreover, an online course on Marine Data Literacy was 'Research excellence' with six modules was developed, with more than 200 students registered from all universities. Another example is virtual teaching collaboration initiatives in the form of Learning Online Courses (LOCs) which aim to pair teachers from partner universities to implement virtual mobility for their students in order to discover other ways of teaching and other pedagogical approaches. Around 40 lecturer-pairs were formed that enabled around 800 students to experience 'internationalisation-at-home' from their first year at the university (in pandemic times). The investment in equipment in the first stage of the alliance allowed installing at least 2 high-tech rooms in each university, fully equipped with high-tech video-conferencing systems set up in different SEA-EU campuses. These rooms will be complemented with new digital equipment that will allow optimising distance learning, including laboratory sessions. During the second phase of the SEA-EU implementation, the efforts focus on developing joint and new digital pedagogies and training pathways, defining common framework of digital competences, assessing the digital maturity of the alliance, digital internships for students and further implementation of European Digital Credentials for learning (EDC).

A pertinent question in this context is defining what it means for an educator to be digitally competent. Is it enough to master digital tools and technical skills, or should the focus be on how these technologies enhance and innovate education and training? The European Framework for the Digital Competence of Educators emphasises the latter approach, that is the use of technology grounded in pedagogical principles to enhance the learning experience. After Redecker (2017), it organises the digital competences of educators in the following six areas: Professional Engagement (using digital technologies for communication, collaboration and professional development); 2. Digital Resources (sourcing, creating and sharing digital resources); 3. Teaching and Learning (managing and orchestrating the use of digital technologies in teaching and learning); 4. Assessment (using digital technologies and strategies to enhance assessment); 5. Empowering Learners (using digital technologies to enhance inclusion, personalisation and learners' active engagement); 6. Facilitating Learners' Digital Competence (enabling learners to creatively and responsibly use digital technologies for information, communication, content creation, wellbeing and problem-solving).

Discussion

Regarding digital competence, we found that the COVID-19 pandemic has elevated the digital competency levels and transformed the digital practices of the respondents. We also observed significant variation in digital teaching practices. This brings forward the question of how we can tailor initiatives to meet the diverse needs and experiences of educators. How can we ensure that our efforts not only cater to the basics but also challenge and enhance the competence of those

already at higher levels? What specific courses or learning pathways could be designed to meet the evolving needs of our diverse faculty and staff? With a substantial portion of respondents reporting high levels of digital pedagogic competence, can we harness their expertise to facilitate a positive influence on the development of those who perceive their competence as lower? How can we create collaborative spaces and mentorship programmes that allow our more proficient members to guide and inspire their colleagues, fostering a collective growth in digital pedagogic skills? And finally, what kind a university do we want for the future society? Those questions reflect the dynamic nature and complexity of present challenges in "adapting to, and adopting, the skills, capacities and capabilities of learning to deal with intellectual uncertainty and of acting and leading beyond the conventional boundaries of disciplinary and professional authority" (Blewitt 2010: 396). Last but not least, we want to stress that even the most advanced technology should not be above humanity (Sułkowski et al. 2021).

We must also acknowledge that the local context plays a significant role. Variations in digital infrastructure, learning management systems, and software platforms across universities can introduce challenges when attempting to transfer specific technical aspects of training. One potential avenue to tackle this challenge is to adopt a pedagogy-first approach, emphasising how to effectively achieve pedagogical goals using the capabilities of digital technology, at the same time as we focus on providing guidance on adapting to local digital infrastructure and technological solutions.

It is also imperative for us to consider the development of offers that create space for critical discussions about the ethical and responsible use of digital technology in education. This also applies to the use of advanced language models and artificial intelligence (AI) which are rapidly reshaping both society and education, introducing profound questions about the future of teaching, learning, and the organisation of university programmes and courses. The survey data by Eurostat (2019) underscore the high degree of uncertainty and limited training in the field of AI among both students and staff. This highlights a pressing need to address this gap and provides

opportunities for training and education. What does AI, and the rapid development of increasingly sophisticated AI systems, mean for pedagogy, knowledge acquisition, and the design of educational experiences? AI has the potential to revolutionise education, offering opportunities to create adaptable, flexible, and advanced learning experiences. However, it also introduces new risks and challenges, such as rethinking assessment design and safeguarding privacy.

Providing students and staff with training opportunities in AI could be of paramount importance not only to address the present needs but also to prepare for the future. We agree with Correia and Reyes (2020) that AI could be seen as a potential game-changer for productivity and sustainability and achieving this depends on having in place the right complementary skills, infrastructure, and management culture. Digitally-enabled collaboration with actors of the innovation ecosystem can also catalyse research and innovation that address societal challenges and increase European competitiveness, and are one of the pillars of the European Commission Open Science initiative in which research is collaborative, open, responsive, and participatory (Owen 2021). Investing resources to make this a shared endeavour within our alliance is worth considering, as it ensures that we stay at the forefront of educational innovation while responsibly addressing the complexities AI brings to our teaching practices.

References

Abad-Segura E., González-Zamar M.D., Infante-Moro J.C., Ruipérez García G., 2020. Sustainable management of digital transformation in higher education: Global research trends. *Sustainability* 12. DOI 10.3390/su12052107.

Blewitt J., 2010. The green campus is also a virtual one. *International Journal Environment and Sustainable Development* 9(4): 392–400.

Carayannis E.G., Morawska J., 2023a. Digital and green twins of industry & society 5.0: The role of universities. In: Carayannis E.G., Grigoroudis E., Katsikas S., Campbell D.F.J. (eds), *The Elgar Companion to Digital Transformation, Artificial Intelligence and Innovation in the Economy, Society and Democracy*. Edward Elgar: 166–202. ISBN: 978 1 83910 935 5

Carayannis E.G., Morawska J., 2023b. University and Education 5.0 for emerging trends, policies and practices in the concept of Industry 5.0 and Society 5.0. In: Machado C.F., Dawim J.P. (eds), *Industry 5.0. creative and innovative or-*

ganizations. Springer 1–25. ISBN 978-3-031-26231-9. DOI 10.1007/978-3-031-26232-6.

Carayannis E.G., Morawska-Jancelewicz J., 2022. The futures of Europe: Society 5.0 and Industry 5.0 as driving forces of future universities. *Journal of the Knowledge Economy* 13: 3445–3471. DOI 10.1007/s13132-021-00854-2.

Cino Pagliarello M., 2022. Higher education in the single market between (trans)national integration and supranationalisation: Exploring the European universities initiative. *Journal of European Integration* 44(1): 149–164. DOI 10.1080/07036337.2021.2011266.

Correia A., Reyes I., 2020. *AI research and innovation: Europe paving its own way*. Working Paper, European Commission. DOI 10.2777/264689.

Deguchi A., Hirai Ch., Matsuoka H., Nakano T., Oshima K., Tai M., Tani S., 2018. What is Society 5.0? In: Hitachi-UTokyo Laboratory (ed.), *Society 5.0. A People-centric Super-smart Society*: 1–25. DOI 10.1007/978-981-15-2989-4.

Gaebel M., Zhang T., 2024. *Trends 2024. European higher education institutions in times of transition*. EUA (eua.eu) (accessed 14 September 2024).

Hamaguchi M., 2020. Imagine universities as prototyping places for social transformation, Michinari Hamaguchi. *The future of universities. Thoughtbook. Universities during times of crisis*.

Hashim M.A.M., Tlemsani I., Matthews R., 2021. Higher education strategy in digital transformation. *Education and Information Technologies* 27(3): 3171–3195. DOI 10.1007/s10639-021-10739-1.

Hodges C., Moore S., Lockee B., Trust T., Bond A., 2020. The difference between emergency remote teaching and online learning. *Educause Review*. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Owen R., 2021. *Enabling open science and societal engagement in research*. Independent expert report. European Commission. DOI 10.2777/057047.

Redecker C., 2017. *European framework for the digital competence of educators: DigCompEdu*. Punie Y. (ed), EUR 28775 EN. Publications Office of the European Union, Luxem-bourg, ISBN 978-92-79-73494-6. DOI 10.2760/159770, JRC107466.

Rêgo B.S., Jayantilal S., Ferreira J.J., Carayannis E.G., 2022. Digital transformation and strategic management: A systematic review of the literature. *Journal of the Knowledge Economy* 13: 3195–3222. DOI 10.1007/s13132-021-00853-3.

Rodríguez-Abitia G., Bribiesca-Correa G., 2021. Assessing digital transformation in universities. *Future Internet* 13(2): 52. DOI 10.3390/fi13020052.

Sá M.J., Serpa S., 2022. Higher education as a promoter of soft skills in a sustainable society. *Journal of Curriculum and Teaching* 11(4). DOI 10.5430/jct.v11n4p1.

Serpa S., Ferreira C.M., 2019. Society 5.0 and sustainability digital innovations: A social process. *Journal of Organizational Culture, Communications and Conflicts* 23(1).

Skulmowski A., Rey G.D., 2020. COVID-19 as an accelerator for digitalization at a German university: Establishing hybrid campuses in times of crisis. *Human Behavior and Emerging Technologies* 2(3): 212–216. DOI 10.1002/hbe2.201.

Sułkowski Ł., Kolasińska-Morawska K., Seliga R., Morawski P., 2021. Smart learning technologization in the Economy 5.0 — The Polish perspective. *Applied Science* 11: 5261. DOI 10.3390/app11115261.

SEA-EU Mission Statement, 2022. https://sea-eu.org/wp-content/uploads/2023/10/SEA-EU-MISSION-STATE-MENT-Updated-February-2022-1.pdf (accessed 3 October 2024).

Vishnevsky V.P., Harkushenko O., Zanizdra M.Y., Kniaziev S.I., 2021. Digital and green economy: Common grounds and contradictions. *Science and Innovation* 17(3): 14–27. DOI 10.15407/scine17.03.014.

Online sources

https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A52022DC0016 (accessed 30 September 2024).

https://education.ec.europa.eu/focus-topics/digital-education/action-plan (accessed 14 September 2024).