Landscaping digital transformation in academic education programmes within Europe.

Grażyna Musiatowicz-Podbiał [a*], *Lucy* Temple [b], *Fernando* Kleiman [c], *Lucía* Bosoer [d]

[a] Department of Informatics in Management, Faculty of Management and Economics, Gdańsk University of Technology, Gdańsk, Poland, grazyna.podbial@pg.edu.pl, ORCID 0000-0002-9343-1883

[b] Department for e-Governance and Administration, Faculty of Business and Globalization, University for Continuing Education Krems, Austria, lucy.temple@donau-uni.ac.at, ORCID 0000-0003-4131-7648

[c] Department Engineering Systems and Services, Faculty of Technology, Policy and Management, Delft University of Technology, The Netherlands, f.kleiman@tudelft.nl, ORCID 0000-0003-3336-3484

[d] Chair AI and Democracy, Florence School of Transnational Governance, European University Institute, Italy, lucia.bosoer@eui.eu, ORCID 0009-0004-0967-7445

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Abstract. This paper aims to recognize content and trends with topics related to Digital Transformation (DT) in educational offers in Higher Education Institutions (HEI), in four EU countries: Austria, Italy, the Netherlands, and Poland. Research is based on benchmarking, recognizing keywords in courses and programmes offered by European universities. The main findings indicate that DT is an essential element of EU education curricula.. The second observation shows DT education as frequently located at the intersection between technology and society. The third finding demonstrates the growing inclusion of DT topics in non-technical disciplines. This research also has practical implications, as its findings on educational portfolios can be applied globally.

Keywords. digital transformation, HEI education, EU courses, digital skills development, digital competencies.
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1. Introduction

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Digital Transformation (DT) can be defined as a multidimensional transformation that results in new developments and redefines practices and relationships between various stakeholders, in the way they offer services and products (Zaoui and Souissi, 2020). In recent decades, the pressure on businesses and governments has increased, leading them to adopt these new ways of working (Kraus et al., 2021, Tangi et al., 2020) and therefore requires essential capacity building. It has been recognized that in Europe, more than 90% of professional roles require a basic level of digital knowledge. On the other hand, it was noticed that around 42% of Europeans still lack basic digital skills, including 37% of those in the workforce (EU 2022a). According to Cedefop (2022) 45% of adult workers acknowledge that they need new knowledge and skills to work with digital technologies. Developing digital skills becomes a top priority, ensuring that people are well-versed in digital skills, which in turn not only boosts the competitiveness of businesses but also empowers individuals to play an active role in shaping the digital future. The future demand for skills will drive increased digitalization, leading to task re-engineering with a strong focus on upskilling and reskilling, particularly in digital competencies. Bearing this in mind, the main research question is as follows: **RQ: What are the essential content elements of educational initiatives driving digital transformation capacity building by HEIs in Europe?**

This paper reveals the findings from state-of-the-art research on educational programmes related to DT available

at HEIs, in four EU Member States: Austria, Italy, the Netherlands and Poland, focused on common trends in the educational agenda for higher education.

2. Methodology

Benchmarking in European HEI's helps to determine learning and promotion strategies, improving the teaching process and curriculum development, to have a positive impact at the educational institution level (Nugroho and Jaqin, 2021). The educational processes are knowledge-oriented and knowledge-intensive (Godfrey and Godfrey, 1999) and therefore justify using a four step benchmark method as described by Spendolini (1992).

The first step of this process was an analysis of the courses and training programmes in four European countries on the topic of DT capacity building. The study focuses on four European countries: Austria, The Netherlands, Italy and Poland. The main activity performed was focused on web-based research in each country, targeting higher education initiatives in the field of DT. Besides course search, a snowballing technique was performed to deepen the information based on the initial findings.

The scope of this research was to find HEIs courses and programmes that would fit training or teaching knowledge and skills for DT in a variety of fields and took place between April and June 2023 and resulted in analysis of 148 courses/programmes.The mapping focused on understanding the main topics (content) offered, the length of programmes (duration), workload (ECTS), and the approach (delivery method) used. To enable subject analysis, each course has been assigned keywords describing its main content for better course differentiation, based on digital transformation characteristics found in n research articles (Phuong, et al,, 2023; Morakanyane, Grace, & O'Reilly, 2017; Morze & Strutynska, 2021).

The coding of courses and programmes has been done assigning a maximum of three keywords to each learning item. The major trends can be identified and deliver insights on DT education in Europe. After listing, analysing, and labelling the courses, a simple count was performed, identifying commonalities and repetitions. The most frequently mentioned keywords were indicated by researchers based on analysis of course topics and content. Independently of recurring in the first, second, or third keyword slot, using the repetition as proxy was a first attempt to formulate the trends.

3. Findings

The state-of-the-art overview has shown that digital transformation is a key element in HEI curricula. To answer the research question, the content of the courses was analysed without upfront selection criteria. The courses represent a wide range of potential training programmes, ranging from entry-level positions (employees) through middle managers to management staff. A total of 55 keywords were listed, and the courses were labelled according to the course description. Within the total of 148 courses identified, 25.7% explicitly mention DT in their programmes, indicating a trend towards creating a specific field in education.

A recurring topic, gaining momentum throughout these countries, is Artificial Intelligence (AI), which is emerging as a key aspect of DT, with several academic programmes dedicated exclusively to it. AI, Data Science, Digital Technology, Technology ethics and Regulation and Governance came next with 12.8% of occurrences (**Tab. 1**). The prominence of AI, data science, and digital ethics within HEI curricula aligns with the 2030 Digital Compass's (EU 2021) vision for a digitally skilled population and the digital transformation of businesses and public services.

Digital Business, Digital Leadership, Machine Learning (ML), Digital Innovation, IT infrastructure, Social Impact and Change management build the next group of keywords, slightly above 7% of occurrences. In this case, more humanities are included (management, social, business), expanding the understanding of digital transformation to its opportunities and consequences.

Tab. 1. Most frequently present focus area of courses (keyword occurring more than 10% of cases)

Keyword	Area	Occurrence	%
Digital Transformation	Economic aspects	38	25,70%
Artificial Intelligence (AI)	Technological aspects	19	12,80%
Data Science	Technological aspects	19	12,80%
Digital technology	Economic aspects	19	12,80%
Technology ethics	Managerial aspects	19	12,80%
Regulation and governance	Economic aspects	18	12,20%

While the EU's overarching DT agenda provides a unified framework, the specific educational responses vary significantly across member states. Each country exhibits unique educational focuses. A discernible trend emerges, emphasizing social impact as a pivotal aspect of digital transformation, highlighting its potential effects on society. These variations reflect the importance of a flexible and context-specific approach when addressing educational offerings.

4. Conclusions

Firstly, the most popular elements of DT curricula are AI, Data Science and Digital Engineering. In addition, emerging elements are: technology ethics, regulation and governance, and digital leadership. This suggests that technological aspects are currently balanced with business and management aspects.
The second observation is that several programmes are located at the intersection between technology and society. While in the past, technological advances were mainly studied in scientific academic programmes, today we increasingly see undergraduate and postgraduate programmes in social sciences, including courses on the impact of emerging technologies and digitalization in government, industries, markets, and society in general.
Additionally, observations revealed that EU's Digital Skills Agenda (EU 2020) is reflected in the wide array of DT programmes offered by HEIs at various educational levels. The interdisciplinary nature of these programmes, which span from technical to social sciences, ensures that digital skills are integrated across diverse fields, promoting accessible and inclusive digital education.

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Use of AI

During the preparation of this work, the author(s) used AI tools for proofreading and language correction of the proposal. After using this tool/service, the author(s) reviewed, edited, made the content their own and validated the outcome as needed, and take(s) full responsibility for the content of the publication.

Conflict Of Interest (COI)

There is no conflict of interest

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