University students' perception of employability and workability skills for the workplace in the digital era

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Abstract— **The digital transformation is profoundly altering the contemporary workplace and work culture, demanding a reassessment of employability and workability skills among university students and graduates. As digital innovations, including artificial intelligence, machine learning, big data and data analytics, cloud computing, conversational systems, robotics, and virtual and augmented reality, revolutionize work processes, redefine job roles, and reshape workplaces, the traditional skill sets required for success may no longer suffice. This study explores the perspectives of university students on the significance of competencies developed during studies in the context of future-oriented employability and workability competencies. A questionnaire survey was conducted among 755 students from various faculties, study modes, and diverse employment types, revealing a gap between students' understanding and their actual possession of competencies. Based on these findings, recommendations are provided to enhance competency development among university students, ensuring their preparedness for the evolving workplace landscape.**

Keywords— competencies, employability, workability, digital transformation, green transformation, work environment, Poland

I. INTRODUCTION

In the ever-evolving landscape of the modern workforce, employability and workability skills have emerged as critical determinants of success for contemporary students (Gupta and Mahajan, 2023). These skills encompass a multifaceted set of competencies that equip individuals with the necessary knowledge, abilities, and adaptability to navigate the complexities of the professional world. The rapid pace of technological advancements and the emergence of new industries have further heightened the demand for individuals equipped with these essential skills, making them paramount for securing employment and achieving career fulfillment (Goulart et al., 2022).

Although commonly used interchangeably employability and workability have distinct meanings. Employability refers to an individual's ability to obtain and maintain employment, typically focusing on skills and knowledge that are directly relevant to specific job roles. It emphasizes the match between an individual's skill set and the requirements of the current job market. Workability, on the other hand, encompasses a broader range of skills and attributes that enable individuals to thrive in the workplace, regardless of the specific job or industry. It goes beyond technical skills to encompass personal qualities, adaptability, and the ability to learn and grow. In essence, employability is about being ready for a particular job, while workability is about being ready for the ongoing challenges and demands of the workplace.

The significance of employability and workability skills for contemporary students extends beyond securing employment. These skills also play a vital role in fostering personal development, career growth, and overall well-being. By developing these competencies, students can enhance their ability to learn new skills, adapt to new technologies, and contribute meaningfully to the workplace. Additionally, these skills contribute to personal fulfilment, allowing individuals to find satisfaction and meaning in their work.

The demand for individuals with strong employability and

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workability skills is particularly evident in the context of rapid technological advancement (Schlegel and Kraus, 2023). The digital transformation has revolutionized industries across the globe, creating new job opportunities while also making existing roles more demanding in terms of technical proficiency and adaptability. To thrive in this rapidly evolving environment, individuals must possess the skills to navigate the complexities of emerging technologies, embrace continuous learning, and collaborate effectively in cross-functional teams.

The green transformation, a global movement towards sustainable practices, is also fundamentally altering the work environment and the demand for work skills and competencies. This transition is shaping new industries, transforming existing ones, and introducing innovative technologies that require a re-evaluation of the skills and knowledge needed for success in the future of work (Kannan et al., 2022). As businesses prioritize sustainability, new roles are emerging in renewable energy, energy efficiency, sustainable manufacturing, circular economy, and climate change mitigation and adaptation. These roles demand a combination of technical expertise, environmental awareness, and problem-solving abilities, requiring individuals to adapt and acquire new skills to thrive in this evolving landscape.

As a result, contemporary students face the unique challenge of preparing for a future workplace that is constantly evolving. To equip themselves for success in this dynamic environment, they must actively seek opportunities to develop their employability and workability skills. This includes engaging in hands-on learning experiences, participating in extracurricular activities, and pursuing internships and volunteer opportunities. Additionally, students can enhance their employability by developing strong academic skills, building a network of professional connections, and maintaining a positive online presence.

Thus, the development of employability and workability skills is not solely the responsibility of students. Educational institutions, employers, and policymakers all play a crucial role in fostering these essential competencies. Educational institutions can integrate employability and workability skills into curricula, provide opportunities for experiential learning, and strengthen career guidance and counselling services. Employers can actively seek individuals with these skills, invest in training and development programs, and create a supportive work environment that fosters talent development. Policymakers can promote initiatives that encourage lifelong learning, support entrepreneurship, and create an environment conducive to innovation and job creation (Cheng et al., 2022).

Addressing these challenges is crucial to ensuring that students are equipped with the necessary competencies to thrive in the contemporary digital landscape and the future work environment. Consequently, this paper aims to analyze how students perceive their competencies developed during studies from the perspective of their employability and workability.

The paper is organized as follows: In the next section, the theoretical background is discussed. Then, the methodology is outlined, followed by the presentation of results. Finally, the discussion and conclusion section presents recommendations for the higher education sector, along with the limitations and future research directions.

II. LITERATURE REVIEW

Future of work environment

The transformative effects of digital and green transformation on the workforce have been subjects of intense scrutiny, initially raising concerns about widespread job displacement due to automation. Frey and Osborne (2017) projected a potential 47% job automation risk in the US, while Bowles (2014) estimated similarly high figures for EU countries. However, subsequent analyses, such as Arntz et al. (2016), have shifted the narrative by emphasizing the task-oriented nature of automation impact, reducing the perceived threat to around 9% in the US and varying from 7% to 33% across European nations. This nuanced understanding highlights that the digital transformation's revolutionary impact lies not in job losses but in the evolution of job roles, necessitating a new skill set that extends beyond digital competencies.

The discourse surrounding powerful artificial intelligence tools, exemplified by entities like ChatGPT and Google's Bard, has also fueled discussions about potential job displacement. Goldman Sachs predicts that generative AI could impact around 300 million jobs globally, with an anticipated automation rate of 18%. The World Robotics 2023 Industrial Robots and Service Robots (IFR, 2023) report further underscores the acceleration of automation, with a 5% year-over-year growth in industrial robot installations.

Contrary to initial fears of job losses, emerging technologies are also anticipated to create novel employment opportunities. Studies, such as those by Arntz et al. (2020) and the Boston Consulting Group (BCG), suggest that the positive impact on job creation will outweigh displacement effects, leading to a net growth in employment. The increasing integration of AI and the rise of the Internet of Things (IoT) are highlighted as contributors to this positive trend, with projections indicating a surge in demand for professionals in these domains. Augmented and virtual reality (AR/VR) technologies are also identified as key contributors to job creation, reflecting the dynamic nature of the job market shaped by technological advancements.

For current university graduates entering the workforce, the overarching challenge lies in preparing for the digital transformation and the imminent shift to Industry 5.0. The prevalence of automation, robotization, and digitization significantly influences the work environment and culture, demanding a set of skills that extend beyond traditional competencies (Da Silva et al., 2020; EC, 2019; Chen et al., 2020; Sharma et al., 2020). The ongoing digitalization, in reshaping the nature of work, underscores the necessity for graduates to possess advanced competencies.

Employability and workability

The concept of employability, also known as employment ability, core ability, key competence, or employment skills, emerged in the early 20th century in Britain. As higher education expanded and career paths diversified in the labour

market, the definition of employability evolved. The Confederation of British Industry (CBI) defines employability as a blend of attributes, skills, and knowledge that graduates and individuals entering the workforce should possess to demonstrate their competence in the labour market and contribute to their personal, organizational, and societal well-being (CBI/Nation Union of Students, 2011). The Organization for Economic Co-operation and Development (OECD) emphasizes that employability extends beyond knowledge and skills to encompass teamwork aptitude, the ability to handle non-routine tasks, communication and problem-solving skills, and even the capacity to transfer knowledge and skills across different contexts (Pont, 2001). The Australian Government's Employability Skills Framework defines employability as the ability of individuals to achieve employment, career development, and realize their full potential, encompassing communication skills, problem-solving abilities, initiative and entrepreneurship, planning and organization skills, self-management skills, and scientific and technological skills (Mclean et al., 2012). Employability is characterized by the accumulation of skills, understanding, and personality traits that benefit individuals, the labour market, communities, and economic development. It is closely linked to the ability to successfully assume career roles and navigate transitions between occupations, fostering sustainable career trajectories (Yorke, 2006). Businesses prioritize graduates with practical work experience and skills. Cumming (2010) corroborates this notion by highlighting the demands of employers and the labour market, advocating for the enhancement of graduates' academic and practical skills by integrating employability skills into college curricula.

Workability is a multifaceted concept that encompasses the ability to perform work healthily and productively given the interplay between an individual's resources – including their health, functional abilities, education, competence, and values and attitudes – and the demands of their work environment (Lederer et al., 2014). Achieving workability requires a balance between these factors, ensuring that individuals have the necessary capabilities to meet the challenges and expectations of their jobs while maintaining their well-being.

From the perspective of sustainable careers, perceived workability refers to an individual's overall assessment of their capacity to continue performing their current work. It reflects their subjective evaluation of how their resources align with the requirements of their job (Nielsen, 1999). Perceived workability is not merely about maintaining employment; it also encompasses a sense of fulfilment, alignment, and satisfaction in one's work. Perceived workability is a crucial component of an individual's long-term health and well-being, serving as a gauge of career sustainability (De Vos et al., 2019).

The future-proof skillset.

In the face of the ongoing digital and green transformation, the demand for STEM skills (including digital ones) has intensified, yet it also calls for a broader range of cognitive and non-cognitive skills. Employers are increasingly seeking individuals equipped with entrepreneurship, critical thinking, creativity, and other non-routine skills, as repetitive tasks are becoming increasingly automatable (Desjardins, 2018; Autor, 2015). These non-routine skills encompass a wide spectrum of abilities, including people management, coordination, collaboration, effective communication, and emotional intelligence. As job roles evolve rapidly in the digital era, employers value employees' adaptability, willingness to learn, and resilience to navigate these changes successfully.

However, despite the growing importance of these skills, a recent survey by the Polish Economic Institute revealed that 91% of companies face difficulties in recruiting employees with the appropriate skill set. For nearly half of the surveyed entrepreneurs (48%), the most deficient competence was creativity, the ability to find non-obvious solutions. Many companies also indicated that they lack people with specialized industry skills (45%) and the ability to collaborate with others (41%). Gaps are also observed in the areas of critical thinking, problem-solving, and cognitive flexibility. Concerning future-proof skills, companies consider the ability to act in a situation of uncertainty to be a key competence, receiving a noticeably higher average rating of 4.21 on a scale of 1 to 5. Creativity and collaboration with others are also predicted to be of very high importance in the future, receiving average ratings of 4.01 and 4.02, respectively. However, the importance of taking responsibility and industry-specific specialist skills is slightly lower, with ratings of 3.99 and 3.94, respectively (Dębkowska et al., 2022).

The World Economic Forum (2022) has identified a set of critical skills that will be essential for success in the future workplace. These skills are categorized into three main groups:

1) Core skills form the foundation for success in any job, regardless of industry or specific role. These skills encompass the ability to adapt to new situations, analyze complex problems, generate innovative solutions, collaborate effectively, and communicate effectively.
- Cognitive flexibility: The ability to adjust to changing circumstances and acquire new knowledge and skills is crucial for navigating the dynamic and evolving workplace.
- Analytical thinking and problem-solving: The ability to identify, analyze, and effectively resolve complex issues is essential for tackling challenges and making informed decisions.
- Creativity and innovation: The capacity to generate new ideas and solutions is paramount in a world that demands adaptability and continuous innovation.
- Teamwork and collaboration: The ability to work cohesively with others towards shared goals is essential for success in team-based environments.
- Communication and interpersonal skills: Effective communication, both verbal and written, is key to building positive relationships, fostering collaboration, and conveying ideas clearly.
2) Digital skills are the cornerstones of proficiency in the digital age. These skills encompass the ability to utilize digital devices and software, analyze data, create software applications, and safeguard digital information.
- Digital literacy: The ability to navigate and operate digital

devices and software effectively is essential for seamless integration into the digital world.

- Data analysis: The ability to collect, analyze, and interpret data is crucial for extracting insights, making informed decisions, and driving data-driven innovation.
- Coding and programming: The ability to write code to create software applications is becoming increasingly valuable in a tech-driven economy.
- Cybersecurity: The ability to protect digital information from unauthorized access, misuse, or disruption is paramount in safeguarding sensitive data and maintaining organizational security.

3) Emotional and social intelligence skills are the driving forces behind building rapport, navigating complex interpersonal dynamics, and thriving in diverse work environments. These skills encompass emotional understanding, empathy, cultural sensitivity, resilience, and the ability to take initiative.

- Emotional intelligence: The ability to recognize, understand, and manage one's own emotions, as well as those of others, is crucial for effective communication and conflict resolution.
- Empathy: The ability to put oneself in another's shoes and understand their feelings is essential for building strong relationships and fostering a positive work climate.
- Cultural intelligence: The ability to navigate diverse cultural contexts and adapt to different ways of thinking is valuable in an increasingly globalized world.
- Resilience: The ability to bounce back from setbacks, overcome challenges, and maintain a positive outlook is essential for navigating the uncertainties of the modern workplace.
- Initiative: The ability to take action, identify opportunities, and make things happen is crucial for driving innovation and achieving goals.

The WEF (2022) emphasizes that these skills will be highly sought-after in the future workforce. As the world of work continues to evolve, businesses will increasingly require employees equipped with these capabilities to thrive in the competitive global marketplace.

Deloitte's 2023 Skills Gap Report (2023) and The McKinsey Global Institute's Skills for the Future of Work Report (2022) also defined the key skills that are currently sought after and anticipated for the jobs of the future, which are:

- Digital skills and technology competency - both reports emphasize the significance of digital skills and technology proficiency in the workforce. Deloitte highlights "digital skills" as a crucial competency, while McKinsey emphasizes "data analysis and knowledge management" and "technology skills." The alignment in prioritizing digital literacy underscores the universal need for employees who can navigate the digital landscape, showcasing a shared emphasis on technological competence across industries.
- Critical thinking, problem-solving, and decision-making - "problem-solving and critical thinking" are identified as

essential skills by both reports, reflecting the universal demand for employees who can analyze situations, think critically, and devise effective solutions. Furthermore, "leadership and decision-making" in Deloitte's report and "cognitive flexibility and decision-making" in McKinsey's report highlight the importance of individuals who can make informed decisions in complex and rapidly changing environments.

- Communication, collaboration, and interpersonal skills - the ability to communicate and collaborate effectively is a consistent theme in both reports. Deloitte emphasizes "communication and collaboration," while McKinsey underscores "communication and collaboration" and "interpersonal and social skills." This convergence highlights the recognition that success in the future workforce depends not only on individual proficiency but also on the capacity to work seamlessly within diverse and collaborative environments.
- Creativity and innovation - "creativity and innovation" emerge as critical skills in both reports, emphasizing the growing need for employees who can contribute fresh ideas and solutions. This shared emphasis suggests a recognition of the role creativity plays in driving innovation and problem-solving across various industries.
- Adaptability, resilience, and lifelong learning - the reports highlight the importance of adaptability and resilience. Deloitte emphasizes "adaptability and resilience," while McKinsey stresses "adaptability and lifelong learning" and "resilience and stress management." The alignment in recognizing the need for individuals who can navigate change and embrace continuous learning reflects the volatile and uncertain nature of the future job market.

Both reports define additional skills. Deloitte includes "data literacy," "emotional intelligence," "industry-specific expertise," and "foreign language fluency," showcasing a diverse set of competencies. McKinsey complements these with "global perspective and cultural intelligence." These additional skills underscore the multifaceted requirements of the modern workforce, reflecting the global and culturally diverse nature of contemporary business environments.

III. MATERIALS AND METHODS

This study assessed digital competence levels among students of private universities in Poland using a structured survey questionnaire based on the future skills selected by the authors as well as Digital Competence Framework (DigComp) developed by the Institute for Prospective Technological Studies (IPTS) in Seville. The DigComp framework, derived from the EU's DIGCOMP project, provides a comprehensive and structured approach to evaluating digital proficiency across various dimensions.

To operationalize the assessment of digital competencies in line with the DigComp framework, a 26-question survey questionnaire was developed. Four questions addressed socio-demographic aspects, while the remaining 22 focused on

dimensions directly related to the research problem. The questionnaire was distributed to respondents using the CAWI (Computer-Assisted Web Interviewing) technique.

The study involved a sample of 755 students from various private universities in Poland, ensuring a diverse and representative representation of the target population. The socio-demographic characteristics of the study participants are presented in Table 1.

Collected data was carefully processed and analyzed using SPSS Statistics, a widely recognized statistical software package for quantitative data research. The ensuing analysis aimed to provide in-depth insights into the digital competencies of students and contribute to the ongoing discourse on digital literacy in educational contexts.

TABLE 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS.

Variable		N	%
Gender	Female	514	68,1
	Male	241	31,9
Age	17-30	619	82
	31-40	117	15,6
	41-50	18	2,4
Study mode	Full-time	231	30,6
	Part-time	396	52,4
	Online	128	17
Employment type	Full-time	259	34,4
	Part-time	164	21,7
	Internship	161	21,3
	None	171	22,6

IV. RESULTS

This section presents an in-depth analysis of the competencies deemed essential for students and professionals in the evolving landscape. This analysis delves into these competencies, exploring variations across gender, employment type, and modes of study.

Key competencies for the future. The study identifies a range of competencies critical for future success. Notably, digital competence in new media (12.97%) emerges as a key skill, reflecting the importance of digital literacy in the modern world. Innovative and adaptive thinking (12.34%) is another significant competency, highlighting the need for creativity and flexibility. Virtual collaboration (10.62%) is increasingly pertinent given the rise of remote work. Other essential competencies include emotional intelligence, interdisciplinary thinking, design thinking, and the ability to navigate information overload.

Gender-based differences in competency preferences. The study reveals interesting gender-based differences in competency preferences. Women, constituting 69.63% of respondents, show a greater inclination towards emotional intelligence (11.59%) and intercultural competencies (9.54%). In contrast, men, making up 30.37%, favour innovative and adaptive thinking (14.77%) and computational thinking (8.92%).

Analysis by employment type. The study further categorizes competencies based on employment type. Remote workers (49.07%) emphasize digital competencies, virtual collaboration, and innovative thinking. On-site workers (32.70%) focus on emotional intelligence, information overload management, and intercultural skills. Online workers (18.23%) also value innovative thinking, digital competencies, and emotional intelligence.

Study mode-based analysis: Differences in preferred competencies also emerge based on the mode of study. Full-time students (32.70%) lean towards competencies in managing information overload, design thinking, and intercultural skills. Part-time students (49.07%) prioritize digital competencies, virtual collaboration, and innovative thinking. Online students (18.23%) highlight similar trends with a focus on innovative thinking, digital skills, and emotional intelligence.

Emotional intelligence and innovative thinking: A closer look at emotional intelligence and innovative thinking reveals diverse competency levels. Women display a balanced distribution across levels 2 and 3, with a notable strength in these areas. Men predominantly exhibit competencies at level 2, followed by levels 1 and 3. The analysis also shows that part-time, online, and modes of full-time study exhibit varying competency levels in these areas.

V. CONCLUSIONS AND RECOMMENDATIONS

The ongoing digital transformation is reshaping the demands of the modern workplace, necessitating a reevaluation of the competencies required for employability and workability in the future. This study highlights the importance of cultivating a multifaceted skill set that goes beyond digital competencies and encompasses a range of soft skills, such as emotional intelligence and innovative thinking. The findings reveal the diversity of future competencies, with variations based on gender, employment type, study mode, and specific skill areas. These insights underscore the need for targeted competency development strategies and effective educational programs that cater to the diverse needs of individuals and prepare them for the future job market. By actively developing these essential skills, students can enhance their employability prospects, achieve career satisfaction, and contribute meaningfully to the ever-changing global workforce. Educational institutions, employers, and policymakers play a crucial role in fostering these skills, ensuring that future generations are equipped to navigate the complexities of the modern workplace and thrive in the digital age.

Recommendations:

Based on the literature review and survey results, the following recommendations can be formulated for higher education institutions in the development of student competencies that meet the needs of the labor market and ensure the employability and workability of graduates:

- Emphasize cross-disciplinary education. Encourage interdisciplinary collaboration among academic departments to foster a holistic understanding of various fields and their intersections, preparing students for the interconnectedness of the modern workplace.

- Promote digital literacy and proficiency. Integrate digital skills development into all academic programs, equipping students with the ability to utilize digital tools effectively, analyze data, and navigate the digital landscape.
- Nurture soft skills and competencies. Incorporate soft skills training into the curriculum, focusing on communication, interpersonal relationships, teamwork, problem-solving, adaptability, and cultural sensitivity.
- Foster entrepreneurship and innovation. Encourage entrepreneurial mindsets and support students in developing innovative solutions, preparing them for the changing nature of work and the demand for creativity and problem-solving.
- Enhance practical skills and experiential learning. Integrate practical training and internships into the curriculum, providing students with hands-on experience in their fields and allowing them to apply their theoretical knowledge in real-world settings.
- Strengthen industry collaborations. Forge strong partnerships with industry leaders to gain insights into industry needs, incorporate industry-relevant content into courses, and provide opportunities for students to connect with potential employers.
- Invest in career counselling and guidance. Provide comprehensive career counselling services to help students identify their career interests, develop personalized career plans, and navigate job search strategies.
- Embrace lifelong learning and adaptability: Encourage lifelong learning and adaptability mindsets, preparing students to continuously upgrade their skills and adapt to the evolving demands of the workplace.
- Foster global citizenship and intercultural understanding. Instil global citizenship values and intercultural sensitivity, preparing students to thrive in diverse workplaces and contribute to a globalized society.
- Emphasize personal and professional development. Promote personal growth, self-awareness, and the ability to manage emotions and build resilience, as these qualities are increasingly valued by employers.

The research results also allow the formulation of recommendations for addressing gender-based differences in competency preferences, which are:

- Provide gender-specific training and workshops to enhance emotional intelligence and intercultural competencies among female students.
- Encourage male students to develop their communication and interpersonal skills to better collaborate with others and navigate diverse social settings.
- Offer mentorship and role models for both male and female students to help them develop the competencies that are valued in their respective fields.

Additionally, recommendations for addressing employment type-based differences in competency preferences were developed:

- Facilitate opportunities for remote workers to develop virtual collaboration and innovative thinking skills through online courses and workshops.
- Provide on-site workers with training on emotional intelligence, information overload management, and intercultural skills to better navigate the challenges of their work environment.
- Offer online workers additional training on digital competencies and emotional intelligence to enhance their employability and workability.

By addressing these gender-based and employment type-based differences in competency preferences, universities can better prepare their students for the future of work and ensure that they are well-equipped to succeed in the challenging and ever-changing job market.

Limitations and future research

The study presents several limitations that suggest potential avenues for future research. Firstly, the geographical scope of the study, which was restricted to Poland, limits the generalizability of our findings. As the concept of employability and workability competencies can be influenced by geographical context and cultural norms, expanding the research to include other nations, such as those in Central and Eastern Europe or the wider European Union is recommended. Doing so would allow for a broader understanding of the factors that shape employability and workability competency perceptions and practices across different cultural and educational environments. Secondly, our research methodology relied on capturing the opinions of students at a specific point in time. While this provided valuable insights into current perceptions, it does not account for the dynamic nature of competency development. Future studies could employ longitudinal approaches to track how competency perceptions and skills evolve among Polish university students over time, providing a more comprehensive understanding of the factors that influence their development and use. By addressing these limitations, future research can build upon our findings and provide a more nuanced and comprehensive understanding of employability and workability competencies among university students in Poland and beyond.

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