The New Normal: How to Educate the ISD and AI Specialists and Enhance Their Competencies in Poland's Post-COVID Era

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Abstract

This paper examines the challenges and opportunities in Poland's Information Systems Development (ISD) and Artificial Intelligence (AI) sectors in the post-COVID-19 era. Highlighting the shift towards hybrid and remote work models, it addresses the significant skills gap in the Polish IT industry, emphasizing the need for enhanced education and training. The analysis reveals a critical shortage of IT specialists, intensified by an inadequate development of competencies alongside technical skills. The paper advocates for strategic educational reforms and corporate training programs tailored to meet the demands of advanced AI technologies and interdisciplinary collaboration, and argues for the necessity of continuous professional development to maintain competitiveness and adaptability in a rapidly evolving digital landscape, incorporating modern pedagogy.

Keywords: AI, competencies, AI education, IS education, pedagogy

1. Introduction

The post-COVID-19 and Generative Artificial Intelligence (Gen AI) Era bring new opportunities and challenges for organisations and teams involved in Information Systems Development. This paper discusses the transformative impacts of ISD and Artificial Intelligence on Poland's IT sector in the post-COVID-19 era, emphasizing the critical need for strategic education, competencies and skills development to address the evolving demands of the digital economy. It presents the results of extensive meta-analyses on the research topic undertaken, as well as the resulting recommendations and conclusions.

2. Methodology and the course of the study

The results presented in this paper were derived from a literature review that involved identifying keywords, searching scientific databases for articles published from 2019 to 2023, analyzing relevant articles, and synthesizing information to identify key themes and trends in ISD/AI specialist education and competencies.

3. Results

According to the results of the study, three main trends have been shaping the future of ISD specialist education: the emergence of new models of work, the rise and development of AI tools, and the disparity of the market needs and the actual competencies and skills of specialists, all discussed below.

3.1. Work flexibility in the hybrid model

The necessity to switch to remote work during the pandemic was associated with disintegration, i.e., the breakdown of the existing structure which often led to a temporary deterioration in functioning, in order to ultimately encourage both employers and employees to seek innovative

solutions in work organisation. Research conducted during the pandemic shows a pattern typical of the crisis situation at the time [9], in which people moved from a shock phase, through the dismantling of existing structures, to an adaptation phase to new, challenging conditions and attempts to reconstruct reality.

Currently, remote work has been accepted in many sectors of the economy, including ICT, and is desired by individuals who value a balance between professional achievement and personal life [4]. After the pandemic, alongside remote work, hybrid work is pointed out as the "new normal." The majority of workers prefer this model of work [1].

The hybrid reality is not unfamiliar to ISD specialists and programmers. The increase in job advertisements offering not fully remote work became more apparent in 2023. After the pandemic, the overwhelming majority of specialists are still interested in remote or hybrid work. In this case, the ability to decide on the nature of cooperation is key. The desire to return to the offices is mainly the choice of employers, who see it as enhancing employee efficiency and having a positive impact on team integration. Various forms of hybrid work are one of the main factors defining current trends in the labour market for specialists. Therefore, it is worth adding that flexibility not only involves the ability to work from home but indeed from any other place in the world with Internet access. During the pandemic, the concept of "workation," which involves working remotely from an attractive tourist location, became popular. Although there are no specific provisions in the labour code regarding such a model, it can be implemented based on agreements between the employer and the employee. During a workation, an employee can integrate fulfilling professional duties with relaxation, which for many represents a significant motivational value, encouraging effective and productive use of work time. Another emerging trend is the "digital nomad," which in practice means living without a fixed residence, travelling around the world, and performing remote work using the Internet. In the U.S. in 2019, about 7.3 million Americans lived as digital nomads, and by 2020, this number had risen to nearly 11 million [2]. This phenomenon is also becoming familiar to Polish workers.

3.2.   Impact of AI on the industry and profession

Another impact on specialist education has been the acceleration of digital transformation, which includes advancing automation and robotization using artificial intelligence, the digitization of the service industry and online commerce, and the widespread adoption of communication technologies, devices for remote work, and new media.

During the pandemic, significant breakthroughs were made in the development of cloud service technologies and a series of minor improvements in the predictive power of AI, which can lead to better products and significant savings. In 2022, 50% of companies worldwide tried to adapt AI-based solutions to their operations, compared with 20% in 2017. AI solutions were implemented in relation to the optimization of service operations, the creation of new AI-based products, customer service analytics and segmentation, and the optimization of talent management and workforce. The average number of practical applications of artificial intelligence solutions in companies doubled from 1.9 to 3.8 products or processes; especially in areas such as robotic process automation, computer vision, natural-language text understanding, virtual agents or conversational interfaces, and deep learning. Another specialization gaining most from the implementation of artificial intelligence in the area of computational machines is the use of automation tools for generating images, text, and sound. In the last three years, startups such as OpenAI, StabilityAI, and Midjourney, which develop generative models creating new images, graphics, or logos for any abstract phrase, have gained immense popularity [2].

The development of AI significantly increases the efficiency and productivity of specialists. For example, consultants using AI completed on average 12.2% more tasks, performed them 25.1% faster, and achieved 40% higher quality results than those who did not use it. Additionally, a study on the impact of AI on the work of IT professionals showed a productivity increase

of 55.8% when using artificial intelligence. Thus, AI can help become more productive. Instead of replacing workers, it can take over routine, time-consuming tasks, allowing them to focus on more complex problems and innovative solutions. This enables an individual to produce more code, applications, or services, which translates into higher added value for companies. Moreover, AI-based tools will be able to automate certain programming processes, although it will take time for them to become standard. Every new technology also requires research, testing, refinement, and adaptation; it too generates the need for the involvement of more specialists [6].

Ministry of Digitalization shows that the Polish economy needed 92,000 AI specialists in 2023 and will need 194,000 by 2025. The creation and implementation of AI solutions require a wide range of IT, mathematical, and statistical skills, as well as business development competencies and interdisciplinary collaboration. It is also necessary to establish teams that are involved both in the creation and training of AI models. This indicates the significant role of collaboration between specialists in the ICT/IT/ISD and AI fields with industry expert groups who understand and manage data within organizations [5].

3.3. Specialist competencies - between diagnosis and needs

ISD and AI practitioners often do not have one clearly defined title or job position; rather, they operate within a broadly understood field. To define a specialist, it is primarily necessary to speak about a certain range of competencies. In the contex of education, the Competence Council of the Ministry of Digital Affairs in the report "Foundations for the AI Strategy in Poland" [3] defined four target groups for educational actions, namely "Specialists responsible for CREATING AI solutions, specialists responsible for IMPLEMENTING AI solutions, helping to co-create and utilize AI solutions in companies and organizations, AI users (USAGE), and groups that will need to adapt to new conditions in the job market as a result of AI implementations and will require retraining (ADAPTATION)" [8].

By definition, an ISD and AI creator is a person who creates AI systems and solutions, knows programming languages, builds machine learning (ML) models, understands the technologies used to create and implement AI, is familiar with AI deployment security standards and can select and apply appropriate AI methods to meet business and social challenges. The concept is broad and may include individuals involved in the creation and implementation of systems - engineers, architects, as well as those performing key support functions in the process - data analysts and programmers. Creators of AI and ML systems need hard competencies, which include technical knowledge such as programming, data processing and analysis, and technical aspects of creating AI systems, including classical Machine Learning algorithms, Deep Learning (neural networks), key neural network architectures, software engineering. In addition, not only technical knowledge but also certain soft skills can be crucial, such as business knowledge, effective communication skills, and the ability to work in interdisciplinary teams - IT, business, domain specialists.

Polish specialists do possess advanced hard skills. Over 50% of specialists in Poland have completed degrees in Computer Science, Mathematics, Electrical and Electronic Engineering, Information Technology, and Mechatronics, Robotics, and Automation Engineering; nearly 35% of experts from Poland have received a diploma in the field of computer science, whereas in the European Union this figure merely amounts to 20%. The most popular area of specialization within AI in Poland is Data Mining and Analytics (over 40% of AI practitioners), the second most common field being Robotics and IoT (over 26% of AI area employees), with a predominance in the Internet of Things category due to the processing of data from devices. The smaller number of specialists with skills responsible for creating solutions in the areas of Computer Vision or Natural Language Processing and Text Mining indicates a concentration of AI experts' activities on data analysis in companies and institutions. They possess programming knowledge in many languages, like Python, R, Java, C++, SQL.

However, Polish specialists significantly less often declare possessing "soft" skills, with particularly large disparities evident in several areas compared to the European Union average. In the area of teaching – the figure for specialists from Poland is 14.7% (EU average - 24.0%), in communication – 10.7% compared to 21.5%, in learning skills – 7.8% to 20.3%, in problem-solving – 5.2% to 8.5%, and in teamwork – 7.5% in Poland compared to 12.4% in the EU [7]. This could pose a barrier to the professional development of specialists, as AI becomes increasingly present in the economy, making the dynamic collaboration in various teams a necessity.

4.   Conclusions

This paper examines the evolving need for ISD and AI competencies in Poland, emphasizing the importance of educational and corporate strategies to prepare specialists for a digital economy post-COVID. It notes the increasing demand for specialists amid a skills gap, highlighting that Polish companies face challenges in recruiting and developing adequate talent. Continuous education, reskilling, and upskilling are essential for ISD specialists to remain competitive in the rapidly changing Generative AI Era.

On top of that, investments in the development of both "hard" and "soft" competencies of specialists are strategic for the long-term growth of the Polish ICT sector, including AI and ISD. Specialists must develop not only hard skills to keep pace with AI development. Expanding soft skills is necessary as they are the factor distinguish the work of a specialist from the work of an ISD/AI model.

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