Introduction

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Societies and economies are not digitally neutral. Technological progress is a disruptive process that stimulates the emergence of a new status quo. Technology and technological change enrich and reshape socio-economic systems, raising their responsiveness and adaptability to further technological development.

The "digital economy" is a multidisciplinary conceptual "umbrella" referring to markets, organizations and their networks that are based on digital technologies, communication, data processing and e-commerce. The digital economy is multidimensional, and its dynamic structure must be analysed considering its various aspects: economic (changes in the nature of resources, production factors and economic processes), technological (technological progress viewed from a macroeconomic perspective vs. technological innovation viewed from a microeconomic perspective), regulatory (challenges facing regulators and new risks affecting the institutional order) and sociological (changes in society functioning principles, attitudes towards work and human relations).

The purpose of this book is to analyse the effectiveness of the implemented digital technologies as well as fundamental factors that contribute to technological progress in the long run. It also analyses structural and qualitative shifts in economies and societies. The following research topics are investigated and discussed: the gap between the level of digital economic development in the EU countries, digital transformation and its impact on the development patterns of labour skills and the legal framework for using data as a resource.

The book is the result of interdisciplinary workshops, namely, (1) "Digital Economy", organized at the Jagiellonian University in Kraków, 23 June 2022, and (2) The Interdisciplinary Insights into Digital Economy, organized at the University of Helsinki on 1 December 2022. During the workshops, we had the chance to present our research to scholars representing other disciplines in a way understandable to specialists from outside our own research orbit. This approach is also visible in the result, that is, the monograph itself: the editors, who conduct research in two different disciplines, prepared the volume in the spirit of interdisciplinarity. Selected chapters are peer-reviewed

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by scholars from other disciplines. This interdisciplinary cooperation has been one of the most rewarding endeavours we have recently undertaken.

The book aims at approaching the topics discussed from a multidisciplinary perspective, ranging from law to economy and sociology. The monograph confirms that, on the one hand, digitalization is a complex phenomenon which alters the economy and society while law does not always keep up with these changes. On the other hand, changes in legislation shape the environment in which companies operate, and new or amended laws may either stimulate or inhibit the development of an economic sector.

In our monograph, we focus on definitional discussions, the problems of measurement, drivers of digital transition, changing labour relations, digital skills and education, data reuse and data extractivism. We closely consider selected aspects of the digital economy, many of which are hot topics. The strength of the monograph also lies in the rich background of the team of authors that consists of researchers from eight European academic centres.

The book is divided into three parts: Measuring the Digital Economy, Sources for Developing the Digital Economy and Nature of Resources.

In Chapter 1 "The dimensions of the digital economy and society", Judyta Lubacha, Rafał Wisła, Michał Włodarczyk and Anna Zachorowska-Mazurkiewicz present and discuss different dimensions and the extent of the impact of digital transformation on the economy. The authors also look into opportunities and risks arising from the digitalization of economic and social processes.

Chapter 2 "Measuring the digital economy with 'digital economy' tools" by Aleksander Żołnierski presents emerging methods of monitoring the use of digital economy that include not only artificial intelligence or big data analysis but also a wide range of technologies of the digital economy itself. The described methodology is increasingly employed in a number of research projects but has not been used on a large scale to date. It can eliminate many imperfections of commonly used quantitative methods. The chapter analyses the potential offered by three of them: (1) big data analysis of unstructured data, (2) analysis based on Google Trends used in many scientific studies and (3) beacon technology which has new applications, e.g., in monitoring the work environment in Industry 4.0.

The main objective of Chapter 3 "Differentiation of the digital economic development in Europe" (Mateusz Biernacki, Agata Luśtyk and Rafał Wisła) is to examine the variation in the digital economic development in Europe. The first section of this chapter contains a review of proposals aimed to measure the digital economy, considering various approaches to its definition. The second section discusses two methods designed to identify changes in the digital economy from a macro perspective and gives the characteristics of data used in the following sections. The third section presents research results with a discussion of their limitations and downsides.

In Chapter 4 "Digital innovation hubs as drivers for digital transition and economic recovery: the case of the Arctic Development Environments

Cluster in Lapland ", Silvia Gaiani and Urszula Ala-Karvia describe the increasingly important role that Digital Innovation Hubs (DIHs) play in the European digital economy where supply chains are systematically digitalized, traditional business models are transforming, companies work in an integrated way and smart distributed production has become a new standard. This chapter first adds to the general discussion on DIHs as supportive ecosystems and underlines their role as drivers of regional competitiveness, innovation capacity and digital transition. Second, it focuses on Finland, the country with the highest IT skills in the world, and specifically on the Arctic Development Environments Cluster which has recently been approved by the European Commission as the first official DIH in Lapland.

The analysis conducted in Chapter 5 by Alejandro Díaz Moreno, Mª del Milagro Martín López, Myriam González Limón and Manuel Rivera Fernández concerns digital transformation and its impact on labour relations. Digital transformation is of such magnitude and is happening so fast in recent years that it is having a major effect on the competitiveness and growth of companies. Digital transformation is changing the nature of work and the structure of the labour market. Digital technologies, on the one hand, minimize production costs by replacing workers with computers and robots and, on the other hand, are related to the balance in the labour market. Digitalization of the economy is a social process that is still under construction and has accelerated in recent years as a result of the pandemic. It involves a new way of understanding the forms of working and the organization of work itself, and therefore has an impact on the complex world of labour relations.

The study contained in Chapter 6 by Helena Anacka and Ewa Lechman concerns the digitalization and digital skills development patterns. It aims to shed light on digitalization and digital skills dynamics in Europe between 1980 and 2022. The authors have identified three research goals: (1) to identify digitalization trajectories in European countries, (2) to identify digital skills development patterns in European countries and (3) to examine digitalization and digital skills inequalities across countries in Europe. Their empirical sample comprises 27 European economies, and the time span of the analysis is set for the period between 1980 and 2022. Statistical data on digitalization and digital skills are extracted from the ITU and Eurostat databases.

In Chapter 7 "Virtual reality in legal education. Challenges and possibilities to transform normative knowledge", Amalia Verdu Sanmartin and Johanna Niemi explore the intersection between digital education and law, explaining how they challenge each other while coming together in a continuous becoming process affecting the substance of the law, the legal profession and education. The chapter is organized so that Part 2 introduces virtual reality, and Part 3 discusses how VR is transforming the classroom into a smart learning environment. Part 4 explores the possibilities of using virtual reality in legal education.

The aim of Chapter 8 "The patent system and the problem of innovation diffusion in the digital economy" (Małgorzata Niklewicz-Pijaczyńska) is to indicate the most problematic, from the perspective of digital management, areas that determine the functioning of patent systems. It also analyses a new function which, once implemented, will make patent regulations an important player in the global process of innovation diffusion. The chapter is based on a critical analysis of the source literature in the field of economics and law. The main conclusions of the chapter state that with the information function implemented, patent systems show a significant potential for a wide spectrum of applications in the process of innovation diffusion. However, in order for this role to be performed in an optimal way, it is necessary to urgently verify the applicable patent rules and thoroughly improve the IT infrastructure so that they respond to the challenges of the digital economy to a greater extent than before.

In Chapter 9 "Behind the transparency of 'data reuse'", Beata Mäihäniemi assesses the framework for the reuse of personal data by gatekeepers, currently being shaped in the EU. The starting point is provided by the question whether data should be seen as property or commons. Current EU-wide regulations such as the General Data Protection Regulation do not create a property right as regards data, although some, such as competition law, are based on the idea that data is an economic good that can be re-materialized and commodified. Moreover, how does the abundance of data affect possible data sharing? It seems that information on the origin of datasets must only be provided when sharing sensitive data. However, the recently introduced EU-wide proposals of the Data Act and the Digital Markets Act are rooted in the idea of "data altruism". The Data Act also aims at empowering users, while the Digital Markets Act imposes several obligations on gatekeepers. The chapter analyses in-force and upcoming regulations in the light of the data as property, commodity/commons divide. What is the legal framework for facilitating the reuse of personal data by gatekeepers? Which pieces of the puzzle are missing?

Chapter 10 "Data extractivism: social pollution and real-world costs" (Christopher W. Chagnon and Sophia E. Hagolani-Albov) utilizes the concept of extractivism to highlight the socio-cultural damage done by data extractive systems in Europe and around the world. Just as previous industrial revolutions relied on resources like coal and oil, the digital revolution has sparked an insatiable demand for its own resource—personal data. Rather than using open-pit mines, data extraction depends on proliferating devices that do their digging by embedding themselves ever deeper into our lives and societies. This desire for data has led to modes of extraction that cause environmental pollution and what could be termed "social pollution", which causes damage to societies and individual lives.

In Chapter 11 "FinTech future trends: secondary data review", Yevheniia Polishchuk analyses how the phenomenon of digitalization has also affected the financial sector, how the emergence of such an industry as FinTech has

forced financial intermediaries to adopt the changes we are witnessing now. Currently, investments in FinTech are an integral part of the development strategy of banking institutions and large companies operating outside the market of financial services. Despite the rapid development of the FinTech industry, it faces challenges such as the COVID-19 shock, innovations in FinTech regulation, competition from banks, as well as a lack of specialists with the skills that are required in the FinTech industry. In addition, the image of consumers of financial services is changing, and the role of socially significant projects is growing. The need to identify signals that indicate future developments arises on the part of businesses from the FinTech industry when formulating their strategies. The secondary data review method is used to summarize the reports from various reliable organizations, the main trends in future development of the FinTech industry, providing useful evidence for the decision-making process. The DEEP software has become the main methodological tool for identifying and studying various sectors related to the FinTech industry, factors determining forecast development trends that bring both opportunities and risks.

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