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DANIELE **SCHILIRÒ**

DIGITAL ECONOMICS
EXPLORING THE DIGITAL ECONOMY

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INDEX

INTRODUCTION

Digital economics refers to the study and analysis of economic principles and behaviors in the context of the digital age.

Digital economics is a rapidly evolving field that examines the economic implications and impacts of digital technologies on various aspects of society. With the proliferation of the internet, mobile devices, artificial intelligence (AI), and other digital technologies and platforms, the way we produce, consume, and exchange goods and services has undergone significant transformations. As such, digital economics is helpful for understanding the behaviors and strategies of individuals, businesses, and policymakers.

One of the key elements of digital economics is the concept of the digital economy. The digital economy has become an integral part of our lives. Understanding its fundamental concepts and dynamics is crucial for individuals and businesses alike. Essentially, it refers to economic activities that are conducted through digital channels. This includes online shopping, digital advertising, e–commerce platforms, and digital services such as cloud computing and software as a service (SaaS). The digital economy has experienced remarkable growth in recent years, contributing to job creation, innovation, and economic development.

Digital economics also investigates the impact of digital technologies on traditional industries and business models, analyzing how they adapt and evolve in the face of these technological advancements. Furthermore,

the rise of digital platforms have challenged established players, creating new opportunities for individuals to participate in the sharing economy.

Digital economics delves into the economic effects of automation and AI. In particular, the automation of routine tasks and the emergence of AI–powered technologies have the potential to reshape job requirements and employment patterns. While this can lead to increased efficiency and productivity, it also raises concerns about job displacement and inequality.

Additionally, digital economics investigates the role of data as a valuable resource in the digital age. Data–driven insights and analytics have become essential for businesses to make informed decisions and optimize their operations. However, the collection, storage, and use of personal data raise privacy and security concerns, necessitating the development of regulations and frameworks to safeguard individuals' rights.

In conclusion, digital economics examines the economic aspects of digital technologies. It encompasses the study of the digital economy, the impact on traditional industries, the labor market, the search of new talents, and the role of data. As technology continues to advance, digital economics will remain a vital area of study to navigate the challenges and opportunities of the digital age.

This volume aims to provide an overview of the digital economy. While it does not claim to be exhaustive — due to the rapid changes in digital technologies, digital realities, and related issues — it seeks to equip students and the general reader with the knowledge necessary to navigate this evolving landscape. Throughout the volume, we will explore various topics related to the digital economy, starting with its definition and scope. We will delve into the transformational power of digital technologies and their impact on industries, business models, and consumer behavior. In addition, real–world examples and case studies will be used to illustrate the concepts and provide practical insights. We hope that readers, thanks to this volume, can acquire a broad knowledge and solid foundation regarding the digital economy. Furthermore, they can enrich themselves with the skills necessary to navigate and succeed in this rapidly evolving digital reality.

This volume is the result of research and teaching endeavors within the fields of innovation, digital technologies, and digital transformation.

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CHAPTER I

THE DIGITAL ECONOMY AND THE INTERNET

Introduction

In this chapter, we shall examine the digital economy, its emergence due to the advent of digital technologies, highlighting its characteristics, exploring digitization, and the benefits of the digital economy, while also addressing the problems and challenges it poses. The second important topic of this chapter concerns the Internet, which constitutes the primary technology that has facilitated the development of the digital economy, focusing on the Internet as a general–purpose technology.

1.1. The Digital Economy

The term "Digital Economy" was coined by Don Tapscott (1996) and appears in his best–selling book *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*. In his book, Tapscott reveals how new technologies and business strategies are transforming not only business processes but also the creation and marketing of products and services, the structure and goals of enterprises, the dynamics of competition, and all the rules for business success.

The digital economy has experienced significant growth and trans-formation over the past few decades, driven by advancements in technology and increasing internet penetration worldwide.

A digital economy is one where consumers, companies, and governments exist within a digital society and engage in interactions that generate value for all stakeholders. According to Schilirò (2021), the digital economy encompasses economic processes, transactions, interactions, and activities that are based on digital technologies. It is challenging traditional notions of business structures, interactions among firms, and the way consumers access services, information, and goods. The fundamental element driving the digital economy is hyperconnectivity, which refers to the increasing interconnectedness of people, organizations, and machines facilitated by the Internet, mobile technology, and the Internet of things (IoT). In addition, cost reductions, sophisticated algorithms, Big Data, and enormous computing power allow market transactions, mediated through multi–sided platforms, to reduce the need for hierarchy and hierarchical power and exploit the positive effects of the networks.

1.2. Characteristics of the Digital Economy

The digital economy refers to an economic system that is primarily based on digital technologies and the Internet. It encompasses all economic activities, transactions, and interactions that are conducted through digital channels and platforms.

As highlighted by Schilirò (2022), firstly the digital economy is data–driven and rapidly evolving. Given that data plays an increasingly important role as an economic and strategic resource, it is useful to note that the world's population stood at 8,01 billion at the start of 2023. Out of this population, 5,44 billion people, equivalent to 58 percent of the total global population, use mobile phones.

Furthermore, according to the *Digital 2023 Global Overview Report* (Kemp, 2023), there are currently 5,16 billion internet users worldwide, meaning that approximately 64,4 percent of the world's population is now online; while there are 4.76 billion social media users

around the world. However, it is important to acknowledge that there is still a large portion of the population unconnected in several countries, highlighting the issue of inequality in access to technology both between and within countries, known as the digital divide.

Let's now examine the main characteristics of the digital economy. Among these, as suggested in Tapscott (1996), we can include:

1. *Knowledge.* In classical economics, significant factors of production include land, labor, and capital (financial and physical). However, in the digital economy, knowledge becomes the most crucial resource for organizations. The intelligence factor within the company's human resources determines its success or failure in achieving objectives. Collective knowledge represents the value of the company in the process of creating products and services. Furthermore, technological advancements have enabled the creation of a variety of AI products that are essentially capable of helping company management and staff improve intelligence (*knowledge leverage*).
2. *Virtualization.* In contrast to running a business in the real world in which physical assets require some sort of buildings and means of production, in the virtual world, a person can start a business with a simple device and can reach all potential customers worldwide. In the virtual world, a customer simply deals with an internet site as an enterprise (business–to–consumer), as well as the relationship between various companies that want to work together (business–to–business). In this relationship, a process that occurs in the transaction is the exchange of data and information virtually, without the physical presence of the parties or individuals who conduct transactions.
3. *Molecularization.* In the traditional economic environment, the majority of organizations are managed using hierarchical structures or, in more advanced cases, matrix structures. However, in the digital economy, the organizations that will thrive are those that successfully implement a molecular shape. Molecular shape refers to a system in which an organization can readily adapt to dynamic changes occurring in its surrounding environment.
4. *Connection.* Linking assets, suppliers, workers, and stakeholders through wireless communications enables individuals to make

data–driven decisions, leading to improved safety, efficiency, and visibility across the enterprise.

5. *Disintermediation.* The digital economy also enables companies in various sectors (e.g., oil and gas) to bypass intermediaries or channels, eliminating unnecessary middlemen and establishing a more direct relationship between buyers and sellers. This simplified ecosystem reduces friction and lowers the barriers to entry for players in different parts of the value chain. Remote service monitoring serves as an excellent example of such direct operations. Leveraging remote intelligence to track, monitor, manage, report, and resolve asset issues throughout the service lifecycle eliminates the requirement for full–time, local personnel.

6. *Sharing.* The digital economy operates on sharing. In the near future, many companies will adopt a model of purchasing only what is needed and paying as they go. This approach reduces inventory costs, while buying usage as a service enables companies to pay solely for the time used and the value received.

7. *Personalization.* Another characteristic of the digital economy is customer personalization. Personalization entails customers receiving customized products and experiences from their preferred brands, precisely when and where they desire them. This can be exemplified by providing fleet drivers with specific routes optimized based on their personal preferences and driving habits.

1.3. Digitization

Digitization and the introduction of ICT were crucial prerequisites for enabling the digital economy.

The widespread adoption of digitization highlights that the key to an organization's success lies in its ability to achieve convergence among three key industrial sectors: computing, communications, and content.

Computers, including mobile devices, serve as the nerve center for data processing and the information necessary to carry out business transactions. In the communications industry, the most significant

products are the information and communications technology infrastructure, which serves as a pipeline for distributing data and information from one location to another.

Digitization allows for cost reductions. Additionally, sophisticated algorithms, Big Data, and enormous computing power enable market transactions mediated through multi–sided platforms, reducing the reliance on hierarchy and hierarchical power while harnessing the positive effects of networks (Schilirò (2022).

Thus, important aspects related to the process of digitization include the emergence of Big Data, characterized by a significant increase in available data along with improved connectivity and networks. In addition, Advanced Data Analytics plays a crucial role[1]. The vast amount of data can now be processed in various ways using artificial intelligence (AI) applications that incorporate machine learning and deep learning. This involves the utilization of self–learning algorithms and neural networks for diagnostics. Another aspect pertains to a Pervasive Human–Machine Interface, where the combination of human and machine skills and abilities, such as touch interfaces and augmented reality systems, can yield optimal results.

However, digitization also presents several challenges, such as the availability of trained and talented personnel. Another aspect relates to advancements in translating ideas into reality. This primarily refers to the capacity to convert digital instructions into the physical world, utilizing technologies like advanced robotics, cloud–based products, and 3D printers. Physical devices are often interconnected within a network capable of collecting, transferring, and acting upon information, known as the Internet of Things.

1.4. Benefits of the Digital Economy

The digital economy has undoubtedly brought benefits to organizations and society as a whole. We can identify the following advantages.

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(1) Advanced Data Analytics provides the capability to predict future trends or outcomes, allowing for a deeper understanding of the business. It also provides a wide range of functionalities that enhance strategic decision–making for the future.

The digital economy is transforming people's lives, providing them with greater convenience, choices, and value than ever before.

It is also transforming society by increasing efficiency, fostering economic development, and improving problem–solving capabilities.

Moreover, the digital economy is revolutionizing businesses by offering decision–makers new insights to optimize processes and make smarter decisions.

The digital economy promotes the widespread use of the Internet, effectively transforming the world into a global virtual village.

Additionally, the digital economy enhances the utilization of digital services, leading to significant growth in areas such as finance, education, online streaming, and more.

The digital economy provides a significant boost to e–commerce. Furthermore, the introduction of digital technology has increased transparency in government and other sectors.

The digital economy fosters healthy competition and supports innovation, promoting overall growth.

It has been demonstrated that the digital economy plays a crucial role in driving the growth of small and medium enterprises. The growth of digital technologies is a pivotal factor in a country's development and the success of businesses. Finally, the digital economy has not only reshaped work processes but also redefined the responsibilities of business leaders.

However, the digital economy also presents several challenges, such as the ability not only to train but also to find, and retain talents, as well as the potential need to reassign or lay off workers due to the digitization of production processes.

1.5. The Internet

The primary technology that has facilitated the development of the digital economy is the Internet. With the rapid expansion of the Internet, the traditional and digital economies are converging into a unified system. The Internet has attained a ubiquitous nature, covering a substantial portion of the world geographically. While the Internet redefines

the concept of distance, it does not eliminate geography or the cultural, social, economic, and technological differences between countries. The fundamental idea behind the Internet's economic contribution is to enable the cost–effective and swift sharing of information. This, in turn, enhances information efficiency, leading to increased production of products and services reliant on information sharing.

Cellini (2018, p. 18) identifies three distinct historical phases in the evolution of the digital economy.

The first period spans from the 1960s to 1995 when the Internet was primarily used as a network for communication within the scientific community and between government organizations. This phase is often referred to as the Pre–Internet phase.

The second period covers the years from 1995 to 2014, during which we witnessed the widespread adoption of private PCs for accessing the Internet. This period also saw significant growth in the availability of web content and services, along with advancements in data transmission speed due to modern broadband and DSL connections. This phase, known as the Internet Phase of Human Information, was characterized by the proliferation of portals, search engines, and social networks.

A third period from 2014 to the present day is marked by the emergence of the Internet of Things (IoT) and the Internet of Things (IoT), with a rapid proliferation of connected objects on the network. This period is characterized by the collection and analysis of vast amounts of data from connected devices (Big Data) and the widespread utilization of Artificial Intelligence (AI) algorithms capable of interpreting and adapting the collected data to various contexts.

Today, we are witnessing the emergence of Web 3, which represents the new generation of Internet technologies built upon machine learning, AI, and blockchain technology. While Web 2.0 predominantly revolved around user–generated content hosted on centralized websites, Web 3.0 strives to provide personalized and timely information through the application of AI and advanced machine learning techniques. Enhanced search algorithms and advancements in Big Data analytics enable machines to intuitively comprehend and recommend content, leading to a more intelligent and tailored user experience.

1.6. The Characteristics of the Internet

The Internet has played a pivotal role in enabling the digital economy, thanks to its essential characteristics.

A vast market of end consumers accessing the Internet through smartphones (consumer mobile Internet) for content creation, search, storage, and product acquisition/sales.

A unifying platform that facilitates rapid advancements in information technologies, telecommunications, and sensors.

A primary and indispensable source of knowledge, data, entertainment, transactions, sharing, and socialization.

The reengineering of numerous industrial processes/services to allow direct management by end consumers on the Internet.

In the initial phase, the Internet led to the proliferation of network models, digitization of information, digital innovation, and the growth of the business economy. During this phase, the Internet not only contributed to growth and the digitization process but also fostered the emergence of new business models, leading to the rise of social networks and the so–called "economy of people" (Cellini, 2018).

Subsequently, the Internet, expanding connectivity, the increasing power of networks, and the prevalence of intelligent and interconnected devices mark the transition to a new phase of the digital economy. This phase harnesses technologies such as the Internet of Things (IoT), Big Data, Cloud Computing, and Artificial Intelligence to synergistically enable real–time decision–making and enhance the customer experience within the digital economy realm.

According to Peter Drucker (2020), the digital economy is characterized by the extensive utilization of data and technology to revolutionize existing business models, foster the development of new products and services, establish innovative processes, and cultivate a managerial culture. Drucker emphasizes that new digital technology is significant from a management perspective as it profoundly impacts how work is carried out. In his view, technology in general, and digital technology specifically, play a crucial role in shaping the way humans work.

Let's examine examples of digital technology applications.

WhatsApp serves as a prime example of the digitization of a well–established telecommunications model. It operates as a global telecommunications player without the need for traditional telecom infrastructure.

Facebook, on the other hand, is a major media platform that doesn't generate its own content. It primarily functions as a distributor of content created by its users and other sources.

Netflix is the largest movie streaming service despite not owning any physical cinemas. It has transformed the movie industry by providing a digital platform for content delivery.

The digital economy arises from the convergence of four key phenomena:

– Information Technology: Advancements in mass storage, transistors, micro–miniaturization of data processing and storage capacity, as well as increasingly powerful and efficient operating systems, programming languages, and applications;
– Telecommunications: The widespread coverage and communication capabilities of the Internet and data networks, including mobile networks, enabling seamless connectivity even while on the move;
– Sensors: The miniaturization and processing capabilities of sensors, coupled with their ability to connect to the Internet. This enables the collection and exchange of data from various sources in real–time;
– Internet: The universal standard for access, communication, and data sharing, connecting billions of end consumers globally and facilitating the exchange of information, services, and goods on a massive scale.

1.7. The Internet as a General–Purpose Technology

Cellini (2018) identifies three dimensions of the Internet:

– The Internet as an economic system: In this context, the Internet serves as an instrument that influences the traditional understanding of fulfilling needs. It enables the development of new economic relations and facilitates the favoring of such relations.

 –   The Internet as a relational process: This dimension focuses on the interactions between individuals, viewing the Internet as a "complex adaptive system"[2]. Analyzing the impact of the Internet on society involves understanding its role in shaping relationships and societal dynamics.
 –   The Internet as a technological tool: The Internet is a versatile tool that cuts across various sectors, products, and services. It functions as a General–Purpose Technology with wide–ranging applicability and relevance.

We will focus on the third dimension: the Internet as a General–Purpose Technology (GPT). A General–Purpose Technology is a technology that has the potential to impact an entire economy on a global scale. These kinds of technologies typically involve significant reductions in inputs or substantial increases in outputs. When a GPT emerges, it brings about a paradigm shift in society across various sectors of the economy. Historical examples of such technologies include the steam engine, the advent of electricity, or the turbine engine, widely used in aircraft. Each of these technologies represents a paradigm shift, not only economically but also socially, leading to significant transformative changes.

Moreover, a GPT has the potential to spark a new economic revolution, fundamentally altering societies by impacting existing economic and social structures. Technological innovations of the GPT nature correspond to changes that disrupt existing markets within known sectors or even give rise to new markets and sectors.

A GPT is defined by meeting a series of requirements, including: The technology must have a wide range of applications. It should be pervasive, meaning its adoption occurs across diverse contexts. Innovation should be incremental, allowing for continuous improvement of the technology's characteristics and performance over time without requiring a paradigm shift. The discovery of a new GPT would signify a fundamental shift rather than incremental progress. In addition, the technology must be complementary to other technologies. The new

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(2) For a definition and analysis of the Internet as a "complex adaptive system" see Plsek P., Greenhalgh T. (2001).