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ARTIFICIAL INTELLIGENCE AND CYBERSECURITY AS A KEY DRIVER OF BUSINESS OPERATIONS TRANSFORMATION IN THE CONDITIONS OF THE DIGITAL ECONOMY

Salimova Husniya Rustamovna
Department of Information System and Technology Tashkent State University of Economics, 100066, Tashkent, Islam Karimov Street, 49.
Corresponding author: husniyarustamovna@gmail.com

Abstract
The digital economy is growing rapidly, especially in developing countries. However, the meaning and size of the digital economy are limited and varied. The purpose of this paper is to review the current state of knowledge in order to develop a definition of the digital economy and an estimate of its size. The paper argues that there are three relevant areas. At the core of the digital economy is the "digital sector": the IT/ICT sector that produces essential digital products and services. The true "digital economy" – defined as "the part of economic output that is derived entirely or predominantly from digital technologies and whose business models are based on digital goods or services" – consists of the digital sector and emerging digital and platform services.

Keywords: Cybersecurity, digital economy; trends.

Introduction

The digital economy is a young phenomenon and is becoming increasingly important, with double-digit growth expected annually around the world, with particularly strong growth in the Global South (World Economic Forum, 2025). The driving forces behind this development are economic and political, but of course they are also rooted in technological innovation (which itself is shaped by wider forces). In the 1990s, economic change was largely associated with the advent of the Internet, which remains fundamental to the growth of the digital economy. However, in the 2000s and 2020s, a range of new information and communication technologies (ICTs) spread and supported economic change. This includes the embedding of networked sensors into an increasing number of objects (the Internet of Things), new devices (mobile phones, smartphones, tablets, netbooks, laptops, 3D printers), new digital models (cloud computing, digital platforms, digital services); growing intensity of data usage through spread of big data, data analytics and algorithmic decision-making; and new automation and robotics technologies (OECD 2025).

That impact can be understood as a disruption of existing economic processes, systems and sectors, re-shaping existing consumer behaviour, business interactions and business models (Dahlman et al. 2023). It can also be understood as the emergence of new economic processes,

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systems and sectors. Within individual sectors, we see this readily reflected in dominance of new firms: Uber (world's largest "taxi" company), Facebook (world's most popular media company), Alibaba (world's biggest and most valuable retailer) and Airbnb (world's largest "hotelier"). And new business models come to dominate the discourse even if not yet the economic realities: the notion of "Industry 4.0" (see Figure 1), for example.

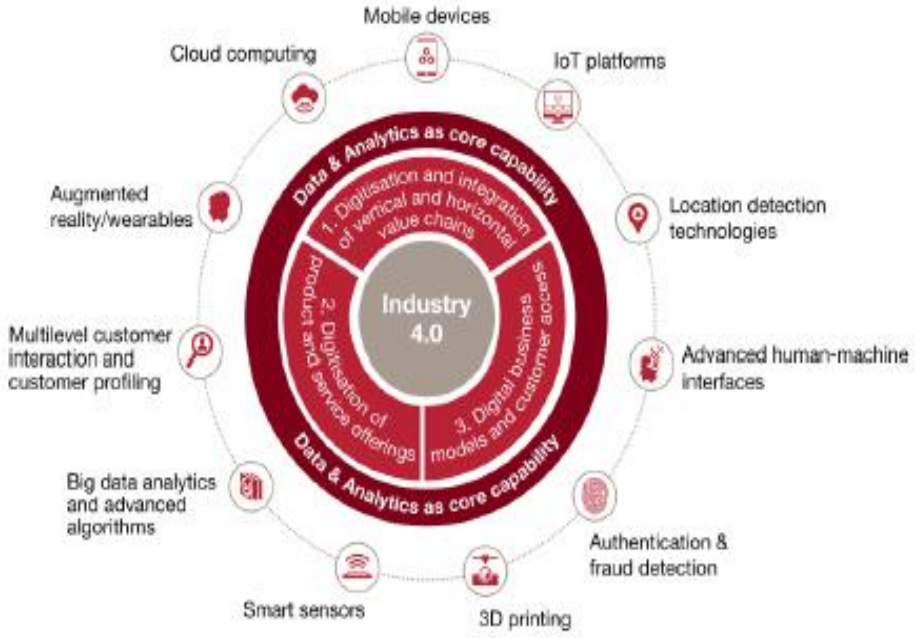

Figure 1: Industry 4.0 framework and contributing digital technologies
Source: Geissbauer et al. (2016)

One model that emerges from a mix of discourse and reality is the notion of the digital economy, argued by some to be the leading driver of economic growth and to lead to "life-changing economic upheavals" and "profound regional implications on businesses, jobs and people" (Brynjolfsson & Kahin 2000, Bahl 2023). For developing countries, there is significant promise that the digital economy will boost economic growth, raise productivity of capital and labour, lower transaction costs and facilitate access to global markets (Dahlman et al. 2023). These are not just empty words: the digital economy is growing 15-25% per year in emerging markets (WEF 2025). There are specific digital dividends already observed that may counter-act economic inequalities: above-local-average wages for digital labour in the global South potentially leading to global convergence of incomes (Beerepoot & Lambregts 2025); new and unique local markets for digital start-ups within developing countries (Quinones et al. 2025); and digital platforms in the global South providing an escape route from ineffective, corrupt market and labour institutions (Lehdonvirta 2023).

In today's reality, digital financial assets have become as valuable or even more valuable than physical assets, protecting these digital assets - from customer data to strategic financial information - is a colossal task that requires a multifaceted approach. Financial institutions must do everything to ensure that their cybersecurity measures are reliable, scalable, and able to withstand the ever-changing landscape of cyber threats and cyber attacks.

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Literature Review

The growth of the digital economy is associated with the growth of new technologies and the expansion of the internet. Cyber threats, such as data theft, hacking, and ransomware attacks, threaten the stability of the digital economy. The article "cybersecurity and economic growth" by m. A. Albrecht and s. R. Zubair provides detailed information on the threats and their economic impact. Cybersecurity strategies play a key role in ensuring the stability of the digital economy. In "effective cybersecurity policies for the digital economy", k. R. Johnson and l. M. Smith review the key principles needed to develop and implement effective cybersecurity policies. User trust is essential in the digital economy. In his article "trust in the digital economy: the role of cybersecurity", c. D. Lee analyzes how users perceive security measures and their impact on the digital economy. Cybersecurity issues are often overlooked in the process of digital transformation. E. F. Brown shows how cybersecurity can be effectively applied in the process of digital transformation in his work "digital transformation and cybersecurity challenges". Cyber threats can lead to financial losses. T. H. Roberts analyzes the financial losses caused by cyber threats and strategies to combat them in his article "the financial impact of cyber incidents". International cooperation and regulatory frameworks for cybersecurity are important for the development of the digital economy. In their work "international cooperation in cybersecurity", a. M. Green and b. T. White analyze the role of international cooperation and its impact on the digital economy.Cyber threats and cyber security strategies play an important role in the development of the digital economy. This literature review will help to expand and deepen the understanding of the topic. Focusing on cyber security issues will help to ensure the sustainable growth of the digital economy.

Problem Formulation

Building from the prior analysis, we can identify three elements relating to conceptualisation of the digital economy. All definitions give some acknowledgement that digital technologies of some kind are the foundation for the digital economy. But only a few, in their explanations, identify the production of these technologies and related foundational services as part of – indeed as the core of – the digital economy.

None of the definitions restricts itself solely to the digital sector but always adds some component of the “ICT consumption/application” category noted in Figure 2. Thus, the digital economy must be defined as being broader than simply the digital sector. At their broadest, overall definitions of the digital economy cover all digitally-enabled economic activity. But this raises a problem: “Increasingly the digital economy has become intertwined with the traditional economy making differences between them less clear” (OECD 2023); “The digital economy is increasingly interwoven with the physical or offline economy making it more and more difficult to clearly delineate the digital economy” (European Parliament 2025). Not only is there a problem of clarity, there is also a problem of scope: as more and more services, manufacturing and even primary production activities rely on ICTs, the digital economy under these definitions increasingly becomes just “the economy”.

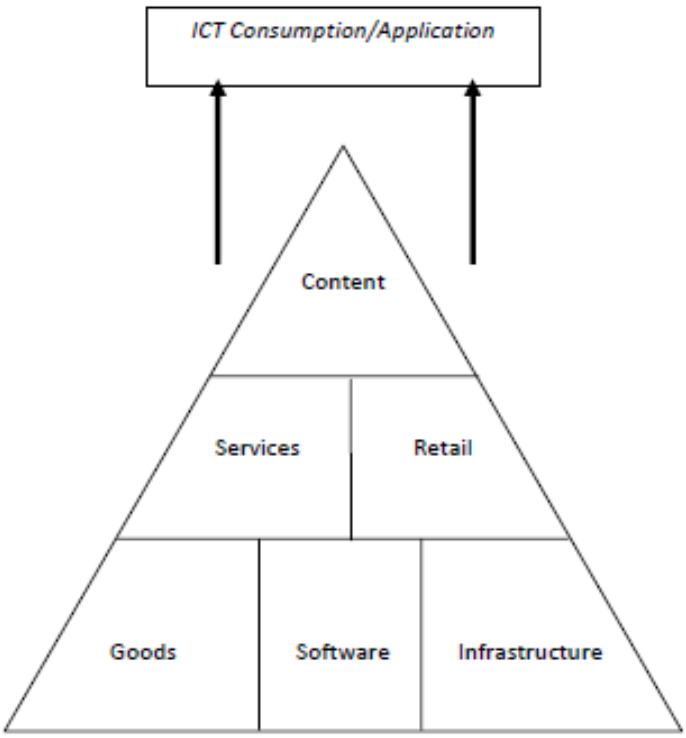

Figure 2: Typology of ICT sub-sectors
Source: Heeks (2008)

To partly skirt this problem, we will not refer to this broad scope – covering all economic activity based on digital technologies – as the digital economy but, instead, as the digitalised economy. This arises from the differentiation between "digitisation": conversion of data from analogue to digital form; and "digitalisation": application of digitisation to organisational and social processes (including economic activity) (Brennen & Kreiss 2024). This broad-scope definition therefore covers e-business (ICT-enabled business transactions) and its sub-set, e-commerce (ICT-enabled external business transactions), algorithmic decision-making in business, use of digitally-automated technologies in manufacturing and agriculture including Industry 4.0 and precision agriculture, etc.

Based on this and the central notion of extensivity, we therefore define the digital economy as "that part of economic output derived solely or primarily from digital technologies with a business model based on digital goods or services". The definition has a blurred boundary but it is also flexible enough to incorporate digital and digital business model innovation over time. As Figure 3 summarises, it encompasses both the core digital sector and also the broader range of extensive digital activity, without claiming that all digitised activity is part of the digital economy.

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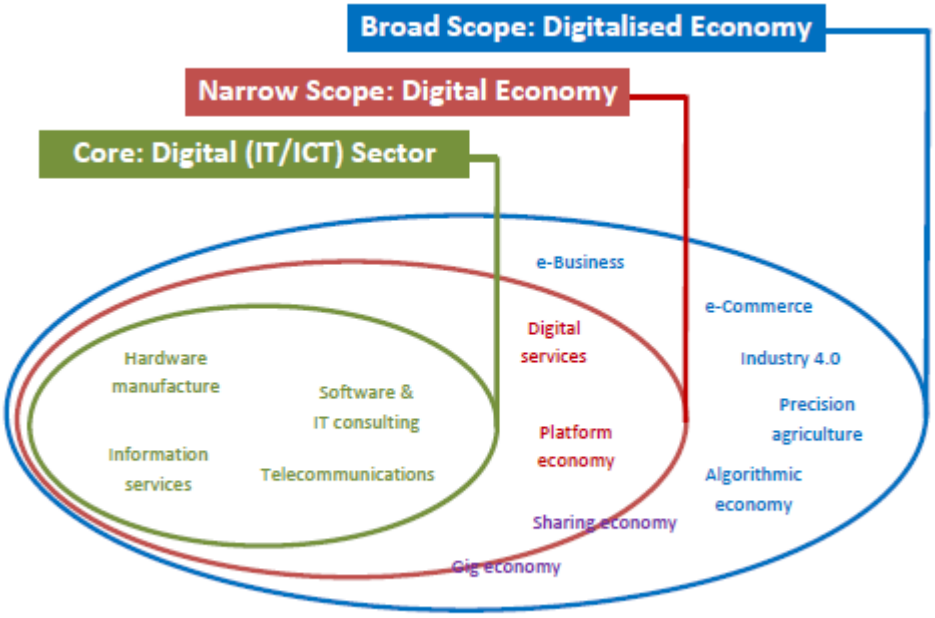

Figure 3: Scoping the digital economy
Source: Authors

Analysing the digital economy definitions in Table 1, one can identify a number of different perspectives reflected:
Alongside these direct components of definitions, we can identify:

Solution of the Problem

Given the increase in digitally-enabled economic activity and hence its growing economic importance, measuring the digital economy is an essential process. But it is a flawed process:
Good policy making, tax policy and the allocation of resources require high-quality data. This does not exist at present in the digital economy, and policy making cannot therefore be reliably expected to support as much as possible the digital economy" (House of Commons 2023)
Finally, there are much higher estimates which encompass the digitalised economy. For example, those suggesting the value of e-commerce in 2023 was US$16.2tn; just over 21% of global GDP (UNCTAD 2025). And those suggesting the size of the "digital economy" (but defined as per the digitalised economy above) represented US$19tn or 22.5% of the global economy in 2025 (Knickrehm et al. 2023).

Results and Discussion

Notwithstanding the lack of direct digital economy measures, one can draw other conclusions about the digital economy from the available data:
i. The digital economy is unevenly distributed. There is uneven distribution between global North and global South. For example, McKinsey figures estimate the Internet economy in 2020 contributing 3.4% of developed country GDP but only 1.9% of "aspiring country"10 GDP, with the former contributing 78% and the latter 22% of the overall Internet economy (Manyika & Roxburgh 2021, Gnanasambandam et al. 2022). Figure 4 shows the data for 2022, with the GDP share of the Internet economy in Africa well below that of other country groupings at just 1.1%

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(Manyika et al. 2023). Likewise, three-quarters of global e-commerce was accounted for by the US, UK, Japan and China (UNCTAD 2025).

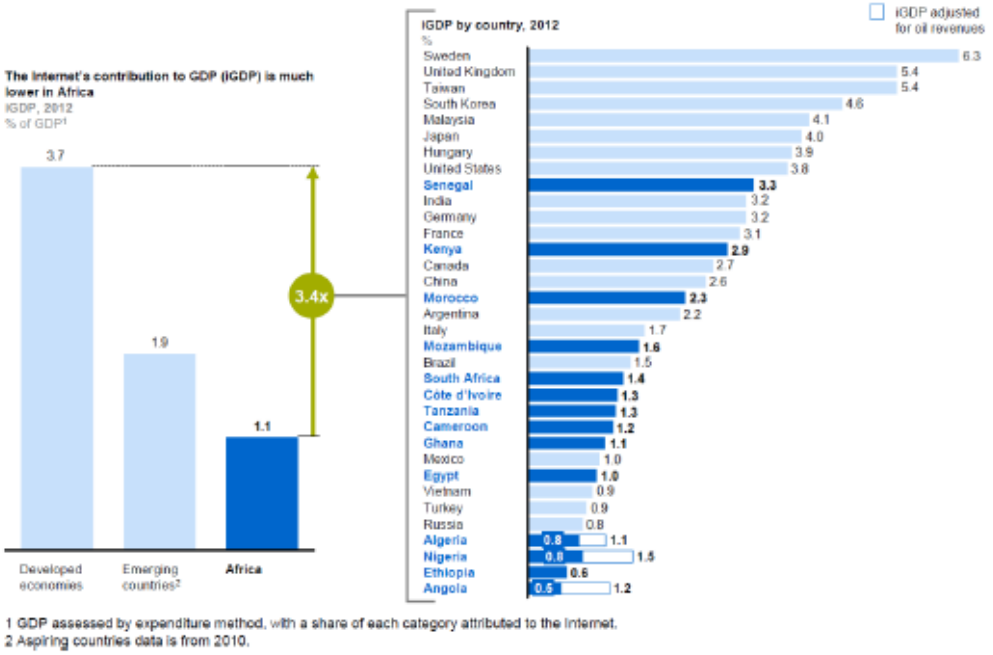

Figure 4: Size of the Internet economy in Africa
Source: Manyika et al. (2013)

There is also uneven inter-regional distribution. For example, the US dominates the global North's digital (IT/ICT) sector, taking around one quarter of the global total (ITA 2022). Within the US, this contributes 7.1% of GDP11 which is well above the OECD average (ibid.). The same applies in the global South. Using McKinsey's figures (du Rausas et al. 2021), two-thirds of Internet economy GDP in aspiring countries came from the four BRICs (see also Figure 4). Digital economy leaders include India (with more than 7% of GDP estimated to come from the IT sector alone (Nasscom 2023)) and the Philippines (with more than 7% of GDP estimated to come from the BPO sector alone (Chang et al. 2023)).

Labour productivity in the digital economy is generally higher than that in the overall economy. For example, labour productivity was US$90,000 per head in the general economies of the OECD, and more than US$160,000 per head in the ICT sector (OECD 2024), which fits roughly with the idea of nearly 4% of employment but more like 6% contribution to GDP/value added. The specific ratio will depend on the digital economy sub-sector: productivity levels were 160% above those of the total economy in telecommunications services but only 21% higher in IT services (ibid.)13. The ratio may be higher in developing countries: for example, in India average labour productivity per worker in the mid-2020s was around US$10,000 but in the software industry was more than US$37,000 (Heeks 2025).

Conclusion

Economic and political imperatives are combining with technological innovation to spur growth of the digital economy, with growth levels particularly high in developing countries. This growth must be strategised by the private sector, guided by government, and analysed by civil society

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and academe. Yet the foundations for these actions are missing with definitions, concepts and measures of the digital economy currently in rather a mess.

Measuring the digital economy faces challenges of fuzzy boundaries, poor data quality, pricing problems, and invisibility of much digital activity. Acknowledging many caveats, we see the digital economy as defined here probably making up around 5% of global GDP and 3% of global employment. Overall measures hide significant unevenness: the global North has had the lion's share of the digital economy to date, but growth rates are fastest in the global South. Potential growth rates in the global South – if barriers could be overcome – are even higher. Separate investigation will be required of opportunities, barriers, and good-practice interventions that are required to realise this potential of the digital economy to deliver significant development impacts.

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