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THE IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY ON BUSINESS

Анотація *У цій статті досліджуються причини впровадження інформаційно-комунікаційних технологій у сучасний бізнес, методи їх інтеграції в організаційні процеси та результати такого впровадження. Удосліджені проаналізовано роботу бізнесу з метою виявлення загальних закономірностей, переваг та викликів, повєязаних із впровадженням ІКТ.*

Ключові слова: *інформаційні технології, інформаційно-комунікаційні технології, цифрова трансформація.*

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Abstract. *This paper examines the reasons behind the adoption of information and communications technology in modern business, the methodologies used to integrate it into organizational processes, and the results of such implementations. The study analyzes businesses to identify common patterns, benefits, and challenges associated with ICT adoption.*

Keywords*: information technology, information and communications technology, digital transformation.*

Introduction. According to data from Momentum, Inc., over 90% of companies use cloud computing in their daily operations, with over 3% of their revenue being spent on IT. The impact of information and communications technology on the global and local economies cannot be overstated: it creates new digital industries, such as e-Commerce, allows more people to enter the workforce through remote work and freelancing, and pushes existing industries to their fullest potential. Research done by the International Data Center Authority indicates that, as of 2024, the digital economy comprises about 15% of the world GDP, which is approximately $16 trillion out of $108 trillion [1].

The impact of information technologies on various industries, including business, has been widely studied by government agencies, private institutions, universities, journals, and independent researchers. Prominent contributors include the Cornell SC Johnson College of Business, the Centria University of Applied Sciences, the Kyiv Global Government Technology Centre, CPR Asset Management, and McKinsey & Company, highlight the impact of ICT on the profits and efficiency of business processes of the modern corporation, the methodology and motivations for its adoption. It is important to note that, while highly appreciating the contribution of aforementioned organizations and the results provided by their research, informational and communications technology remains a dynamic field of science, which means that what is cutting-edge today may be rendered obsolete in the near future.

Problem statement. Based on the above, the purpose of this paper is to research the impact of information and communications technology on businesses, to track the history of this impact, and present the different methodologies used for adopting ICT.

Research results. The level of proliferation of ICT in businesses and industries rises each day. One can characterize the impact of information and communications technology by the emergence of new information industries, which created many new types of services and jobs, and the sophistication of existing industries, such as manufacturing and agriculture.

The process of adopting information and communication technologies is referred to as "digital transformation". It involves a "rewiring" of an organization: the goal is to create value by continuously deploying technology at scale [3]. There is a market for this process, which, as

of 2025, has a size value of approximately $1107,06 billion. By 2031, the value is expected to increase, reaching $1864,94 billion [4]. Rates of adoption of ICT between different regions vary wildly due to economic factors, such as GDP, GDP per capita, and the ability to afford the actual hardware needed for digital transformation. The rate at which businesses adopt ICT is measured with the metric called "adoption rate".

ICT adoption rates between countries are displayed in Table 1.

Table 1

ICT adoption rates between countries

№	Country	Adoption rate
1	United States	70–80%
2	Canada	60–70%
3	United Kingdom	75–80%
4	Germany	65–70%
5	France	65–70%
6	Nordic countries (Sweden, Norway, Denmark, Finland)	~80%
7	China	80–90%
8	Japan	60–70%
9	India	50–60%
10	Australia	65–75%
11	Brazil	50–60%
12	Mexico	50–60%
13	Argentina	45–50%
14	United Arab Emirates	70–80%
15	Saudi Arabia	60–70%
16	South Africa	50–60%
17	Other African nations	>50%

Source: [5].

The process of digital transformation has many effects on the global economy. Notably, many new jobs have been created in the wake of ICT adoption, which are referred to as ICT jobs [6]. According to a 2013 report provided by the World Bank, there are three categories of ICT jobs (Table 2).

Table 2

ICT job categories according to the World Bank report for 2013

№	Type of job	Description
1	ICT-specialist jobs	ICT jobs where specialists develop and put in place the ICT tools for others, and where the main output of the job is ICT itself.
2	Jobs with *advanced users*	Jobs where advanced users, i.e., component users of advanced and often sector-specific software tools. In this type of job, ICT is not the primary role, but rather a tool.
3	Jobs with *basic users*	Basic users are competent in using generic tools essential for the information society, e-government, and working life. ICTs are neither the main job nor the output.

Source: [6].

It is also important to note that information and communications technology make the labour market more transparent. Finding employment generally begins with some kind of job search. In the past, people who sought employment relied on familial ties or acquaintances, which did not reveal the full scope of the market and its trends. This, consequently, made it

harder for employers to acquire the employees they needed, as they had to rely on the local populace. ICT has made the process far easier through mobile platforms like LinkedIn or Indeed, where you can apply for a job with a few taps of the finger or clicks of the mouse. According to data from Skrapp, over 1.2 billion users are registered on LinkedIn, and 25% visit the platform daily, while Indeed has about 350 million active users [7].

The mass usage of ICT in businesses brings forth new opportunities and advantages for both companies and workers, and changes the work process. However, the usage of ICT also brings some disadvantages.

Among the advantages of ICT are improvements in communication, cutting costs, encouragement of strategic thinking, advanced security, and the elimination of human bias from the process of employment [8]. Improvements in communication were visible since the 90s, when electronic mail took off. Nowadays, smartphones and social media permit nigh-instant communication between persons and even allow for remote work. Cutting costs may seem counterintuitive due to the high cost of digital transformation, but the expenses are ultimately worth it because they make further operations far less costly than they were before by streamlining operational and administrative processes. IT encourages strategic thinking through the aforementioned easy communication: employees are less concerned with how to organize meetings or get in contact with their co-workers, since they can relay information through the cloud. Information and communications technology also provides the ability to protect corporate and user data better: as hackers develop more and more sophisticated methods of extracting information, better and better measures of protecting said information need to be deployed as well. Thus, constant deployment of the newest technology ensures up-to-date data security. Lastly, human bias can be removed from the hiring process through the use of artificial intelligence. This is an important advantage of ICT because it negates potential cultural or even racial biases that an employer (or talent acquisition expert) may have [8].

It is important to note that the use of ICT also has its own significant disadvantages. First, the mass deployment of information and communications technology automates certain processes. While this greatly increases efficiency, it also decreases the demand for human labour, which leads to unemployment and potential lay-offs. Second, the high distribution of near-instant communications technology (be it hardware, like smartphones, or software, like Skype or Zoom) makes it so that co-workers don’t need to be around each other (or other people) as much. While not a problem on its own, as remote work has its own advantages, such as the effective removal of time spent commuting and, by proxy, the decrease in air pollution, it can potentially negatively affect mental and physical health. This is because working within a digital environment in physical isolation from others, coupled with the added difficulties in managing work-life balance when not actively attending work premises, often results in poor mental health in individuals without supportive family or pets [9]. Potential physical harm is mostly related to poor workspace management. Meaning, an employee may not be able to have the desired environment that would support productivity or good working habits. Third, excessive dependence on technological devices can become a hindrance due to the following reasons:

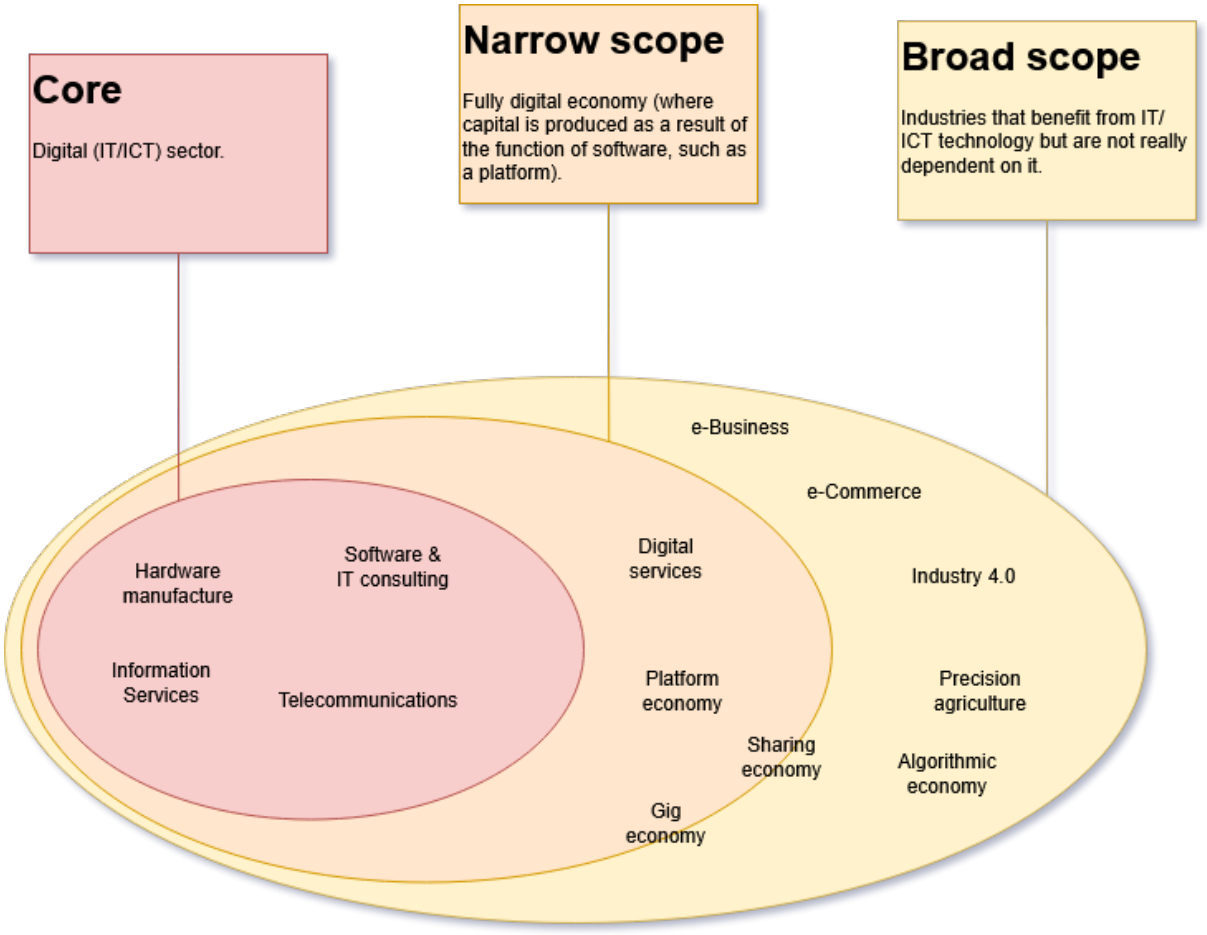
1. Dependence on Internet access for business operations makes them vulnerable, since they require a constant and preferably good connection, which may not be a given.
2. Excessive use of technology can negatively impact the mental and physical health of employees through stress created by work-life conflict. Work-life conflict occurs when work responsibilities intrude into a person’s personal life [10].
3. Heightened reliance on data storage technology, be it physical servers or cloud technologies, brings increased cybersecurity risks, which lead to points 4 and 5.
4. Potential judicial problems. Enterprise owners cannot afford to be ignorant of what is involved in client data protection, and as such must adhere to certain regulations passed by

legal entities, such as governments. If a potential data breach occurs, an enterprise may be sued, which will incur costly legal proceedings.

5. High cost of digital transformation. Digital transformation is a costly process due to the hardware, software, and manpower involved. It may prove too costly for an enterprise to deploy ICT in large quantities.

As mentioned above, the mass implementation of information and communications technology has created a "digital economy". Notably, there is no concrete definition of the term, as many sources provide different explanations of the concept, with some dodging a specific definition. However, generally, it is understood that the digital economy is "an economy based on digital technologies" [11].

In their work "Defining, Conceptualising and Measuring the Digital Economy", R. Bukht and R. Heeks provide the definition ‘that part of economic output derived solely or primarily from digital technologies with a business model based on digital goods or services' [11, p. 13]. This definition is somewhat blurred, but also *flexible*, meaning that it can incorporate digital and digital business model innovation over time, as well as different business models. Figure 1 showcases the core, narrow scope, and the broad scope of the digital economy.



Source: [11].

Figure 1. **Different sectors of the digital economy**

The Core sector consists of hardware manufacturing (the production of equipment and devices necessary for digital transformation), information services (services that assist individuals or groups in accessing, organizing, and using information), software and IT consulting (software consulting entails analyzing a client’s software needs and providing expert advice, guidance, and solutions, while IT consulting concerns broader technological needs of a

client). Telecommunications concerns the transmission of information over distance by technological means. This includes fiber optic cables, Ethernet cables, and wireless transmission (for example, Wi-Fi). The Core sector brings profit in the form of capital accrued from the direct selling or usage of ITC.

The Narrow Scope concerns platforms that use ITC, mainly software, to execute a certain function that brings profit. This encompasses digital services and the platform economy. Digital services are services delivered electronically. The clearest example would be streaming apps, such as Hulu, Netflix, or Disney+. The platform economy is more complicated: many sources define it as "a set of initiatives that intermediate decentralized exchanges among peers through digital platforms". The point is that they create value by facilitating transactions rather than producing something themselves, and that they create network effects (a "network effect" means that the value of a platform increases when the number of users and/or suppliers rises) [12]. A good example of a platform is ridesharing applications, such as Uber or Lyft – their value is increased with the number of drivers that sign partnerships with them, and by the number of riders who order trips.

The platform economy is very similar in principle to the sharing economy and the gig economy. The sharing economy is an economic model where people share access to resources (such as housing or transportation) or services (the gig economy and the platform economy are technically part of the sharing economy). In today's day and age, the sharing economy is facilitated by platforms, with the clearest examples being services like Airbnb and, to some extent, Uber and Lyft.

The gig economy is similar to the sharing economy in that it provides a service on demand. But in this case, the service comes from temporary workers: companies temporarily hire individuals as independent contractors to complete tasks ("gigs") on demand (from clients). The most obvious example is the aforementioned ride-sharing apps Uber and Lyft. Gig work (the term used to refer to work accomplished within a gig economy) is often unstable due to earning money per accomplished task. This often results in contractors earning less than the minimum wage [13]. Another disadvantage of this system is that there can be a lack of protection for workers when they report misconduct [13].

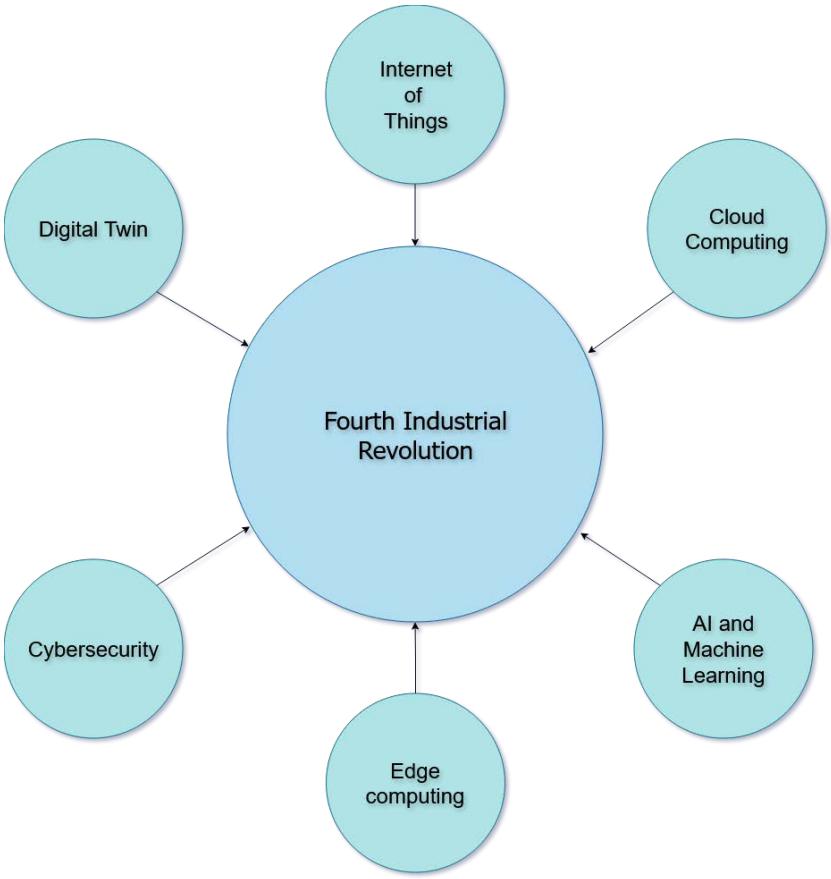
The last sector is the Broad Scope. In this one are industries that greatly benefit from ICT, but are not strictly reliant on it. This includes e-Commerce (i.e., online shops, like Amazon or eBay), e-Business (ICT is used for internal, such as supply chain management, and external, such as buying or selling online), Industry 4.0, precision agriculture, and the algorithm economy.

The term "Industry 4.0" is used to refer to the Fourth Industrial Revolution. An alternate term is "4IR". It, essentially, describes the technological advancement of the 21st century. The main drivers of the Fourth Industrial Revolution are illustrated in Figure 2.

The term "precision agriculture" describes an approach to farming that makes use of ICT and IoT (Internet of Things) to gather information on fields and crops to increase farming efficiency, as well as to avoid potential damage from mismanagement.

The "algorithm economy" is a term used to describe an economy where algorithms are used to process and analyze economic data [15]. Despite relying on ICT to exist, the algorithmic economy is in the Broad Scope because it is an approach to handling an economy, and is thus optional.

Overall, the digital economy generates capital through three things: the manufacturing of information and communications technology, its usage as a platform, and as a tool that complements existing industries. It has its benefits, such as the increased efficiency of its constituents, but also disadvantages, such as a higher skill ceiling for potential employees and a high cost of maintenance. Businesses must carefully consider every advantage and disadvantage and make the right move to stay ahead of the curve.



Source: [14].

Figure 2. **Key drivers of Industry 4.0**

To further understand the impact of ICT on businesses, we must understand current trends and the future of information technology. Among modern trends of ICT that could be useful for a business are cybersecurity, energy transition, artificial intelligence, robotics, the Blockchain, and the Internet of Things.

According to IBM, the greatest cybersecurity threats are AI-assisted threats, AI-powered threats, and quantum computing [16]. AI-assisted threats are, essentially, conventional cyberattack strategies that were automated with AI. This includes using artificial intelligence to create more sophisticated malware, automating phishing, and scaling fraud [17]. AI-generated malware can be made to morph its code to evade endpoint detection and response (EDR) systems, with the clearest example being BlackMamba [18]. AI enhances scam and fraud operations by scaling them up through automation. Fake websites and reviews can be created to fool unsuspecting customers into dealing with fraudulent businesses. To combat this, IBM recommends that different cybersecurity teams collaborate and diversify to combat emerging hacking tools and techniques effectively. Another cybersecurity threat is quantum computing. The heart of the threat lies in the ability of quantum computers to fundamentally disrupt cryptographic algorithms, such as RSA or ECC.

Energy transition refers to the increased energy demands of modern data centers. As more and more large data centers are created, companies will need to adapt to their new energy needs by cooperating with researchers and the energy sector. Thus, energy companies could bring in record profits.

Perhaps, the main trend of ICT at the moment is artificial intelligence. In a business, AI can be used in IT operations and service management to streamline them, as it allows a team to quickly sift through large amounts of data and detect anomalies more efficiently [19].

Robotics is also a noteworthy trend. As robotics advances each year, robots become cheaper and easier to produce, which makes them viable for businesses to use. Those who would benefit the most from cheaper robots would be companies that conduct risky business, such as oil and gas companies.

Next up, the Blockchain. The Blockchain is a shared, immutable digital ledger that enables the recording of transactions and the tracking of assets within a business, providing a single source of legitimate information. This system is resistant to tampering because it is decentralized [17]. Each transaction is grouped into blocks, which are linked together, forming a secure and transparent chain (hence, "Blockchain"). This provides a tamper-proof record, which is great for supply chain management. The key advantage of using the Blockchain is the lack of need for intermediaries, such as banks or other third parties.

Finally, the expansion of IoT technology could provide businesses with more data regarding the preferences of their customers, allowing for quicker adaptations of products according to reviews.

Conclusion. Information and communications technology is reshaping every aspect of society. Its impact on culture cannot be understated and is characterized by globalization. Advanced communication technologies, such as wi-fi, along with digital platforms, have made it possible for people from one corner of the globe to talk with those from another. This allows different cultures to intermingle, causing something called "cultural hybridization" [19]. Cultural hybridization results in the blending of different customs and traditions, along with other cultural aspects like music, fashion, and cuisine, which brings in valuable information for a business, as it can now understand the preferences of this new audience and adapt its products for them.

The economic impact of ICT is, perhaps, the most visible. With the aforementioned formation of the digital economy, new high-income jobs are generated by the three sectors of this economy in manufacturing, software engineering, and digitalized industries. The digital economy has created many new business models, such as: advertising model (a model where a service is provided to users for free, with revenue coming from advertisers who pay to display their ads on the platform for the users to see), the freemium model (a basic service is provided for free, with more advanced features being locked behind a paywall), the usage-based model (where customers pay for exactly the amount of services they use), the e-Commerce model (selling physical products online), the marketplace model (selling and buying products online), the ecosystem model (a range of interrelated services that create a network effect that binds customers, i.e. Apple products), the access-over-ownership model (the sharing economy), the experience model (enhancement of physical products with digital technology), the subscription model (monthly or yearly payments to access a service), the open source model (free of charge software with an open source code), and the hidden revenue model (revenue from sources not immediately obvious to a customer, such as partnerships).

The key drivers of digital transformation are innovations in technology, evolving customer expectations, the desire to automate or streamline certain business processes, and potential benefits from accepting new technology. Innovations in technology themselves are a key driver because when they are developed, competitors may find ways to use them for their benefit, forcing businesses to try and do the same more quickly. Automating and streamlining business processes directly benefits companies, as they don’t need to spend as much on them. The main benefit of accepting new technology is the ability to spread information about the business, such as advertisements, across a much wider audience, and to improve manufacturing processes (for companies that produce physical goods).

Overall, in the modern age, technology decides whether or not a business will succeed or be rendered irrelevant. The one with the most advanced technology wins. However, it is important to consider vulnerabilities brought by technology and mitigate them efficiently.

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