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## COMPETITIVE ADVANTAGES OF THE IT SECTOR IN UKRAINE IN THE CONTEXT OF WAR

TUNITSKA Yuliia<sup>1</sup>, OSIPOVA Sofia<sup>2</sup>, KOVALCHUK Andriy<sup>3</sup>

<sup>1</sup>State University of Trade and Economics

<https://orcid.org/0000-0002-8501-1299>

e-mail: [juliar\\_2006@ukr.net](mailto:juliar_2006@ukr.net)

<sup>2</sup>State University of Trade and Economics

<https://orcid.org/0009-0001-4184-7633>

e-mail: [s.osypova\\_fmtp\\_5\\_24\\_b\\_d@knute.edu.ua](mailto:s.osypova_fmtp_5_24_b_d@knute.edu.ua)

<sup>3</sup>State University of Trade and Economics

<https://orcid.org/0009-0009-7474-8461>

e-mail: [a.kovalchuk\\_fmtp\\_6a\\_24\\_b\\_d@knute.edu.ua](mailto:a.kovalchuk_fmtp_6a_24_b_d@knute.edu.ua)

*The article provides a comprehensive study of the formation and implementation of competitive advantages of Ukraine's IT sector in conditions of full-scale war. The dynamics and structure of IT services exports are analyzed, revealing a steady trend toward growth in their share of total services exports and identifying Ukraine's key trading partners, in particular the United States and European Union countries. It is argued that the decisive competitive advantage of the IT sector in conditions of military instability is the availability of highly qualified human capital in sufficient quantities at a relatively lower level of remuneration compared to the leading countries of the world and the EU. The unique ability of the Ukrainian IT business to accelerate capitalization, high adaptability, and operational stability despite the constant impact of the destructive consequences of military aggression on the national economy has been identified. The role of enterprises in the industry in complying with international regulatory compliance standards in the field of information security has been outlined, and practical experience in implementing relevant technological and organizational solutions has been summarized.*

*Keywords: IT sector of Ukraine, export of IT services, human resources, IT companies, outsourcing, military aggression, digitalization, startup, IT specialists, compliance in the field of information security, international requirements and standards, development of information systems, sanctions.*

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### STATEMENT OF THE PROBLEM IN GENERAL AND ITS RELATIONSHIP WITH IMPORTANT SCIENTIFIC OR PRACTICAL TASKS

The accelerated transformation of the global digital market, combined with the multidimensional challenges of martial law, highlights the decisive role of the IT sector in the structure of Ukraine's national economy. In the context of full-scale war, this industry is one of the key factors in the country's economic stability and international competitiveness, ensuring stable foreign exchange earnings, high operational flexibility, and the ability to adapt quickly in uncertain conditions.

The functioning of Ukraine's IT sector is based on deep integration into global digital value chains, with the US market dominating as the leading trading partner, as well as on the formation of a stable positive business reputation, due to the provision of highly qualified outsourcing services and compliance with international standards of information security systems. The combination of significant human capital with a developed and crisis-resistant startup ecosystem creates unique competitive advantages for the industry. Taken together, this gives reason to consider Ukraine's IT sector as a strategic driver of innovative economic recovery, capable of transforming global and military challenges into new opportunities for long-term sustainable development.

### ANALYSIS OF LATEST RESEARCH AND PUBLICATIONS

The issue of the development and competitiveness of Ukraine's IT industry, especially in the context of martial law, is the focus of attention for many scientists. Researchers view this sector as a strategically important element of economic recovery, accounting for a significant share of GDP and service exports. The specifics of the functioning of IT companies in wartime, in particular the problems of financial stability, have been studied in the works of B. V. Lugovets [1]. The issue of human capital development as a key resource of the industry, the analysis of migration processes and changes in the geographical concentration of specialists in wartime are covered in the study by O. V. Vilkhovska [2]., N. V. Kovalenko and O. A. Yurchenko conduct a thorough analysis of the competence of domestic IT companies and systematize the external factors that determine their competitiveness in a dynamic environment. The

authors emphasize the critical importance of implementing flexible management models that allow companies to adapt their potential to the challenges of martial law and maintain a stable position in the market [3]. The study by S. Urba and I. Repeta provides an in-depth analysis of the competitiveness of Ukrainian IT outsourcing in the context of global economic transformations. The authors provide a detailed justification for a set of strategic measures aimed at strengthening the international positions of domestic developers and increasing Ukraine's attractiveness as a partner on the world stage[4].

### HIGHLIGHTING THE PREVIOUSLY UNSOLVED PARTS OF THE GENERAL PROBLEM TO WHICH THE SPECIFIC ARTICLE IS DEDICATED

At the same time, despite the existence of solid achievements, rapid changes in the security situation and the constant transformation of the global digital market require further study of the mechanisms for adapting the Ukrainian IT business and ensuring its competitive advantages, particularly in the context of improving the compliance of information security systems and retaining human resources.

### FORMULATION OF ARTICLE OBJECTIVES

The purpose of this article is to conduct a thorough study of the peculiarities of forming competitive advantages for Ukraine's IT sector in the context of military aggression.

### PRESENTATION OF THE MAIN RESEARCH MATERIAL WITH FULL JUSTIFICATION OF THE OBTAINED SCIENTIFIC RESULTS

In recent years, Ukraine's IT sector has demonstrated steady growth, becoming one of the leading drivers of the national economy and shaping the country's image in the international arena. The sector's share in Ukraine's GDP reached 4.4%, providing the economy with foreign currency revenues of \$6.45 billion (Fig. 1). Despite the martial law in the country, IT services exports have shown systematic growth, confirming the sector's ability to act as a key factor in the development of export potential, stable currency flow, and a catalyst for economic recovery and further sustainable development in Ukraine.

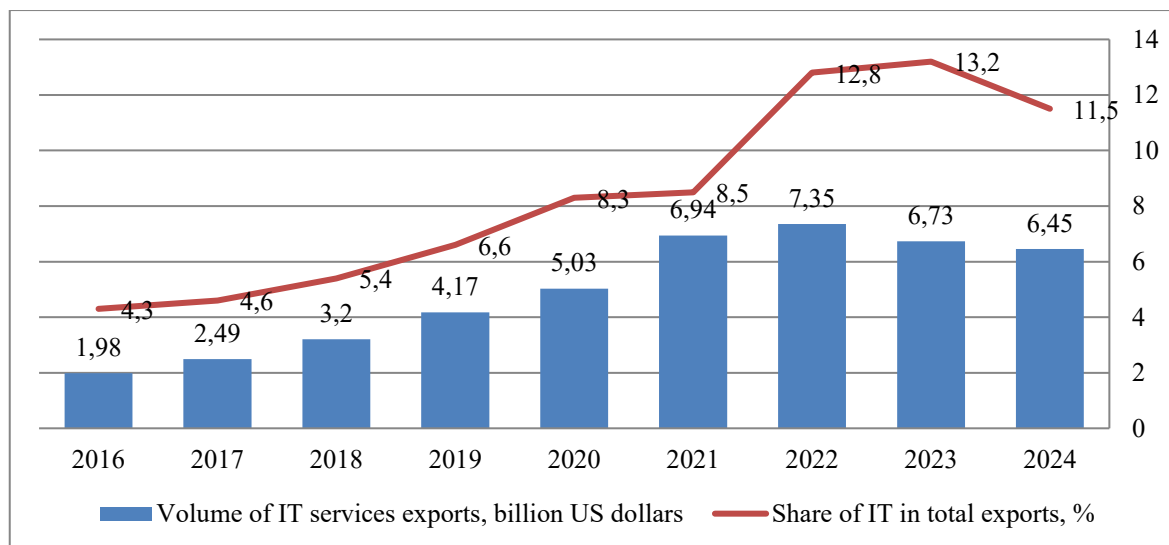


Fig. 1. Dynamics of IT services exports in Ukraine in 2016-2024, billion dollars

Source: compiled by the authors based on data from [5]

At the same time, computer services accounted for 43% of the country's total service exports in 2025, which is 5% more than in 2024 (Fig. 2).

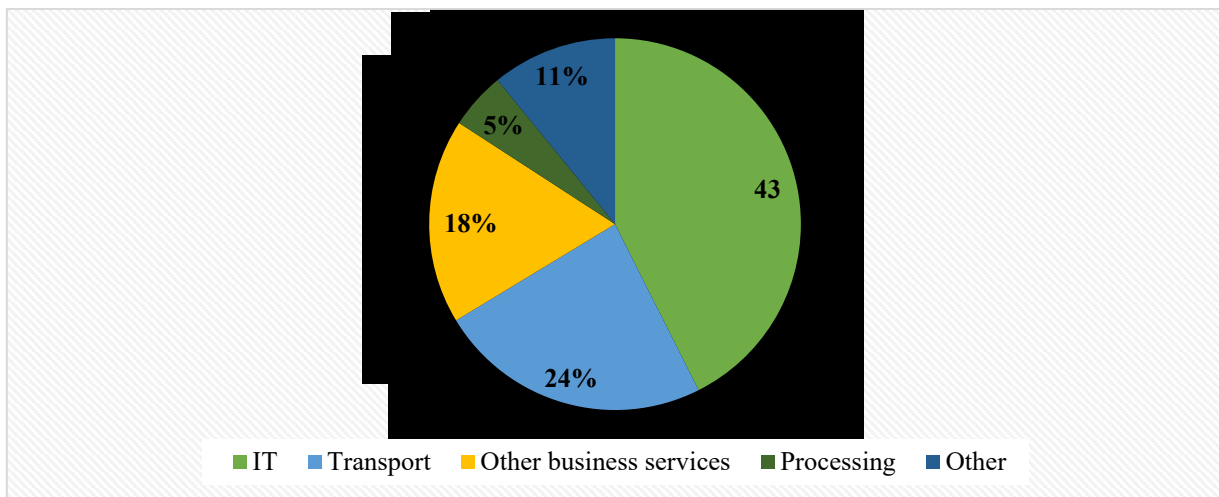


Fig. 2. Structure of service exports in Ukraine in 2025

Source: compiled by the authors based on data from [6]

In 2024, the US remains a key trading partner for the Ukrainian IT sector, accounting for 37.2% of total service exports. The United Kingdom (8.8%) and Malta (7.8%) will rank second and third in terms of export volume, with Cyprus, Israel, Germany, and Switzerland also accounting for significant shares. Overall, the dynamics of demand from foreign markets indicate the strong integration of the Ukrainian IT industry into global technical value chains (Fig. 3).

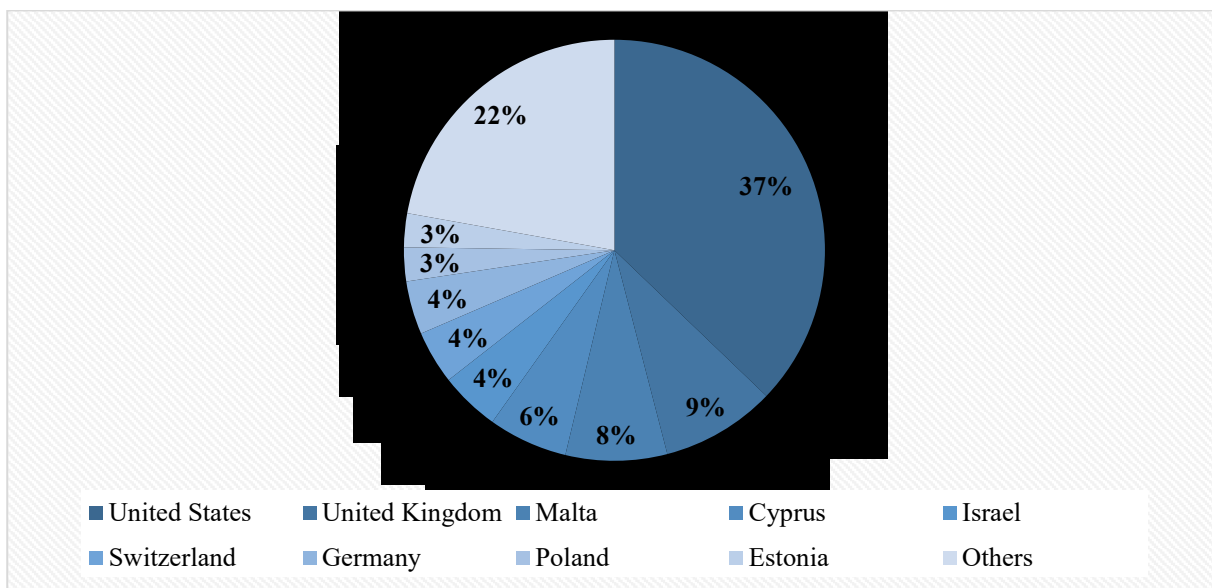


Fig. 3 Geographical structure of IT services exports in Ukraine in 2024

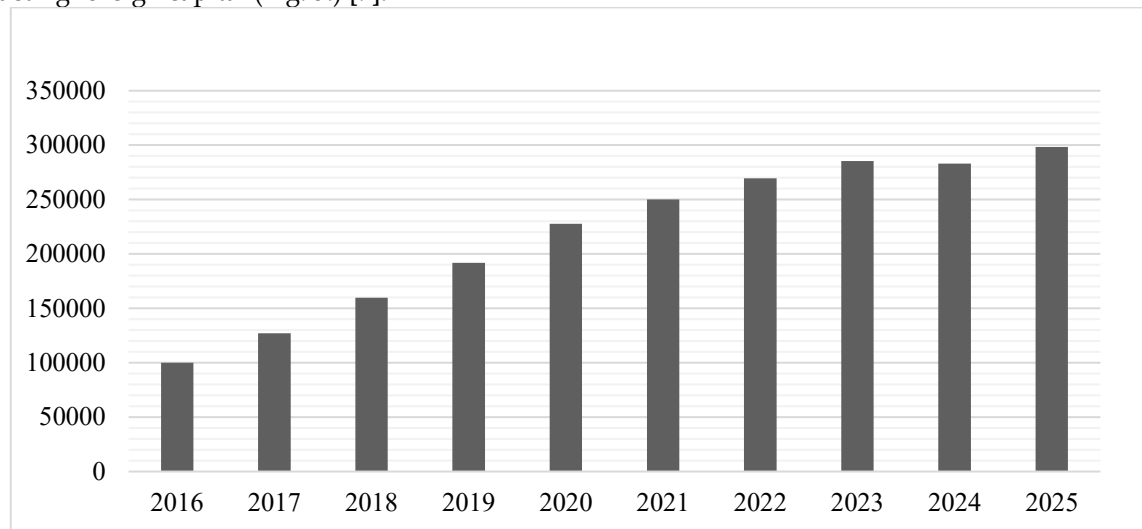
Source: compiled by the authors based on data from [6]

Ukraine's stable and decisive competitive advantage remains its highly skilled human capital, which ensures the country's leadership in Europe in terms of the number of graduates with technical degrees. In 2025, the IT industry had over 300,000 specialists, of whom 238,000 were employed within the country and 62,000 worked abroad (Fig. 4).

Ukrainian specialists have extensive experience in international projects and possess the necessary relevant skills in line with the dynamics of the global market. The most priority areas are artificial intelligence, machine learning, cybersecurity, and cloud technologies. An additional advantage of our specialists is their high level of English proficiency (85% of technical specialists confirm a level of intermediate or higher) [8].

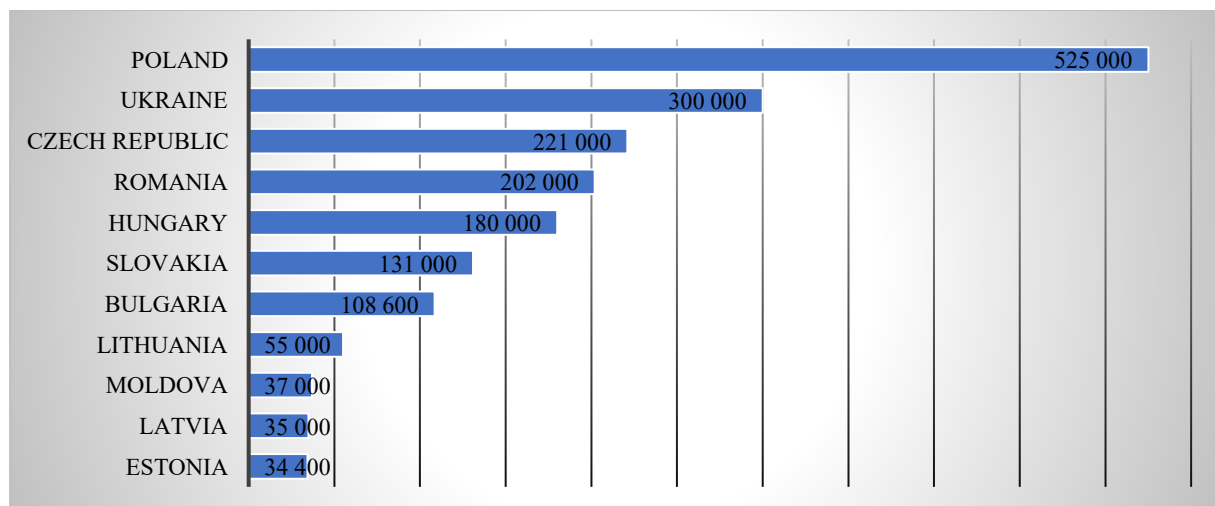
The Eastern European market for technology services has a high concentration of professional capital in Poland and Ukraine. Poland remains the leader with the largest IT talent pool (over 500,000 people). Despite geopolitical challenges and the state of war, Ukraine remains a leading outsourcing hub with a potential of 300,000 specialists. Romania, the Czech Republic, and Hungary also show steady market

growth of 10-15% annually among regional leaders. At the same time, the Baltic countries, Moldova, and Slovakia are actively strengthening their positions and creating a favorable institutional environment for attracting foreign capital (Fig. 5.) [9].



**Fig. 4. Dynamics of the number of IT specialists in Ukraine in 2016–2025**

Source: compiled by the authors based on data from [7]



**Fig. 5 . Number of IT specialists in European countries in 2024, specialists**

Source: compiled by the authors based on data from [9]

In addition to the high quality of services, the Ukrainian IT sector continues to be attractive to foreign investment due to its significantly lower labor costs. Labor costs in Ukraine are only 40-60% of the level typical for Western Europe and the US. The rates of Ukrainian specialists range from \$35 to \$55 per hour, while foreign specialists perform similar work for \$100 to \$150 per hour. Despite the fact that the IT sector provides some of the highest salaries within the national economy, in international comparison, the average monthly remuneration of Ukrainian IT specialists remains one of the lowest among developed countries (Fig. 6), which creates an additional competitive effect for the export of IT services.

Today, the Ukrainian IT sector has 2,118 verified companies, demonstrating high structural diversification and flexibility of business models. Approximately half of them belong to the service segment (47% outsourcing, 3% outstaffing), 31% are product companies, and 19% operate under a mixed model [11]. Such structural diversity allows the industry to respond quickly to global challenges and demands of international markets. Ukrainian IT companies cover a wide range of activities, including software development, cybersecurity, R&D, IT consulting, e-commerce, blockchain technologies, machine learning, artificial intelligence, logistics platforms, and marketplaces (Table 1). This multi-segment presence creates a synergistic effect, increasing Ukraine's competitiveness in the global digital market.

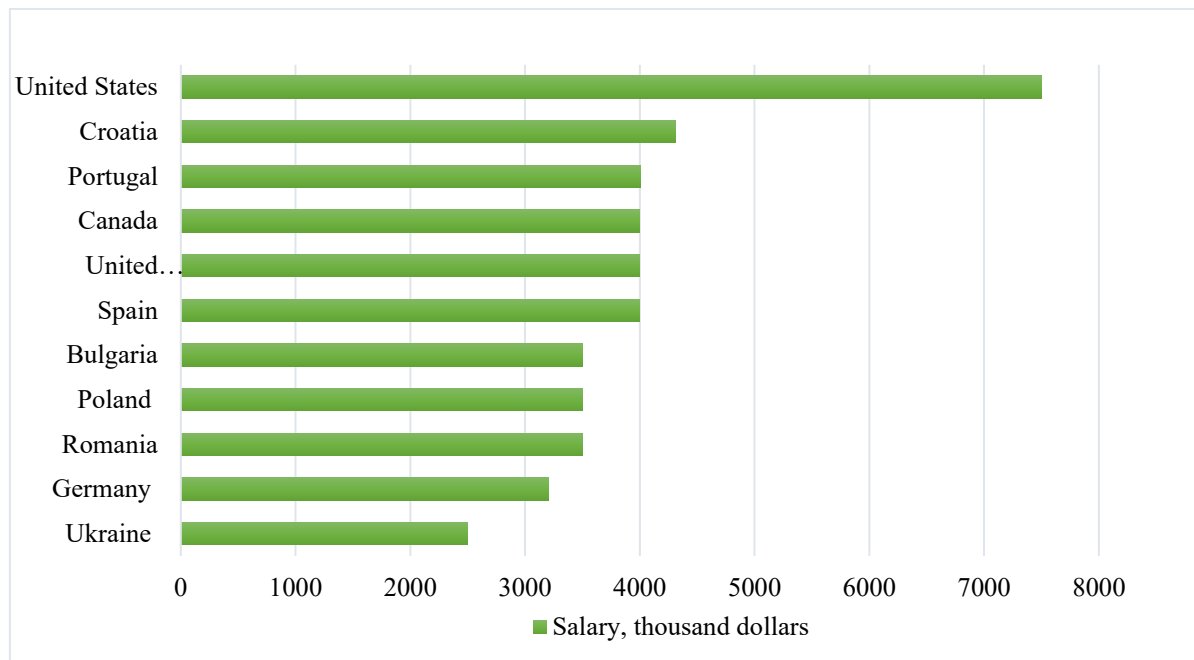


Fig. 6. Average salary in the IT sector worldwide, thousands of dollars

Source: compiled by the authors based on data from [10]

Table 1

**Ranking of the largest IT companies in Ukraine in 2025**

Rank	Company	Scope of activity	Cities where the company has offices	Specialists in Ukraine	Technical specialists
1	EPAM Ukraine	Outsourcing and consulting in software development	Kyiv, Kharkiv, Lviv, Dnipro, Odesa, Vinnytsia, Zhytomyr, Ivano-Frankivsk, Uzhhorod, Khmelnytskyi, Cherkasy, Chernivtsi.	9350	8630
2	SoftServe	Software development and digital business solutions	Kyiv, Kharkiv, Lviv, Dnipro, Odesa, Vinnytsia, Ivano-Frankivsk, Lutsk, Poltava, Rivne, Ternopil, Uzhhorod, Khmelnytskyi, Chernivtsi	7242	5618
3	GlobalLogic Ukraine	Software engineering and product development for clients	Kyiv, Kharkiv, Lviv, Mykolaiv	5465	5134
4	Ajax Systems	Development and production of security systems	Kyiv, Kharkiv, Lviv, Vinnytsia	3913	1167
5	Genesis	Creating your own digital products and startups	Kyiv, Lviv	3156	1317
6	DXC Luxoft	IT consulting and corporate software development	Kyiv, Dnipro, Odesa	3000	2228
7	Evoplay	Online game development	Kyiv	2476	1740
8	ZONE3000	IT services and software development	Kharkiv Lviv, Dnipro	2252	1866
9	DataArt	Custom software development and IT consulting	Kyiv, Kharkiv, Lviv, Dnipro, Odesa, Vinnytsia, Ivano-Frankivsk, Kremenchuk, Poltava	2139	1836
10	Intellias	Software development and digital business transformation	Kyiv, Lviv, Ivano-Frankivsk, Uzhhorod	2109	1665
Total				79109	60307

Source: compiled by the authors based on data from [12]

The Ukrainian IT market is concentrated around several leading outsourcing companies, including EPAM Ukraine, SoftServe, and GlobalLogic Ukraine, confirming the key role of outsourcing in shaping the industry's export potential. The geographical concentration of activity is also high: more than 52% of all

registered IT companies operate in Kyiv, which also leads in terms of total net income (67%). Significant regional clusters include Lviv (10.4%), Kharkiv (8.1%), Dnipro (4.2%), Vinnytsia (3.4%), and Odesa (1.7%). Despite devaluation risks and military aggression, the IT market is showing accelerated growth compared to other sectors of the economy, continuing to attract foreign investment, create new jobs, and act as one of the most promising and innovation-active sectors of the national economy.

In an era of rapid digitalization, competitive information technologies are becoming critical to the effective functioning of the economy. Companies are forced to quickly adapt to growing market demands and quality standards by integrating advanced technologies into their work processes. For example, the use of artificial intelligence to optimize logistics, customer services, and consumer preference analysis gives companies significant competitive advantages through big data processing. At the same time, large corporations focused on stability and risk minimization often demonstrate inertia in implementing breakthrough innovations, limited flexibility, and high costs of transformation projects. In contrast, startups, thanks to their risk-taking, agility, and creative approach, contribute to technological progress, generate new ideas, and respond to non-standard market challenges [13].

Full-scale war has exacerbated conditions of uncertainty, forcing Ukrainian IT companies and startups to develop extraordinary flexibility, speed of adaptation, and innovative uniqueness. Unlike Western corporations, which prioritize stability, Ukrainian IT culture functions effectively in a dynamic and unpredictable environment, which increases its global competitiveness.

A striking confirmation of this is the highly skilled outsourcing provided by Ukrainian IT service companies. More than 100 subsidiary R&D centers are engaged in development and research for international corporations in the fields of software, telecommunications, the gaming industry, and e-commerce. Evidence of confidence in Ukrainian talent includes cooperation with Microsoft, Samsung Electronics, Apple, Wargaming, Boeing, Skype, eBay, Siemens, and IBM [9].

A comparison with the Polish IT sector demonstrates the phenomenal success of Ukrainian startups. While the ecosystems of both countries developed almost synchronously until 2018, in 2019–2021, the total capitalization of Ukrainian startups grew to over €200 billion, compared to €60 billion in Poland, thanks in particular to such "unicorns" as Grammarly and GitLab (Fig. 7). Despite the negative consequences of the full-scale invasion, Ukraine's technology sector has maintained its capitalization at a level significantly higher than in 2020, consolidating its position as one of the leading centers of innovation in Central and Eastern Europe.

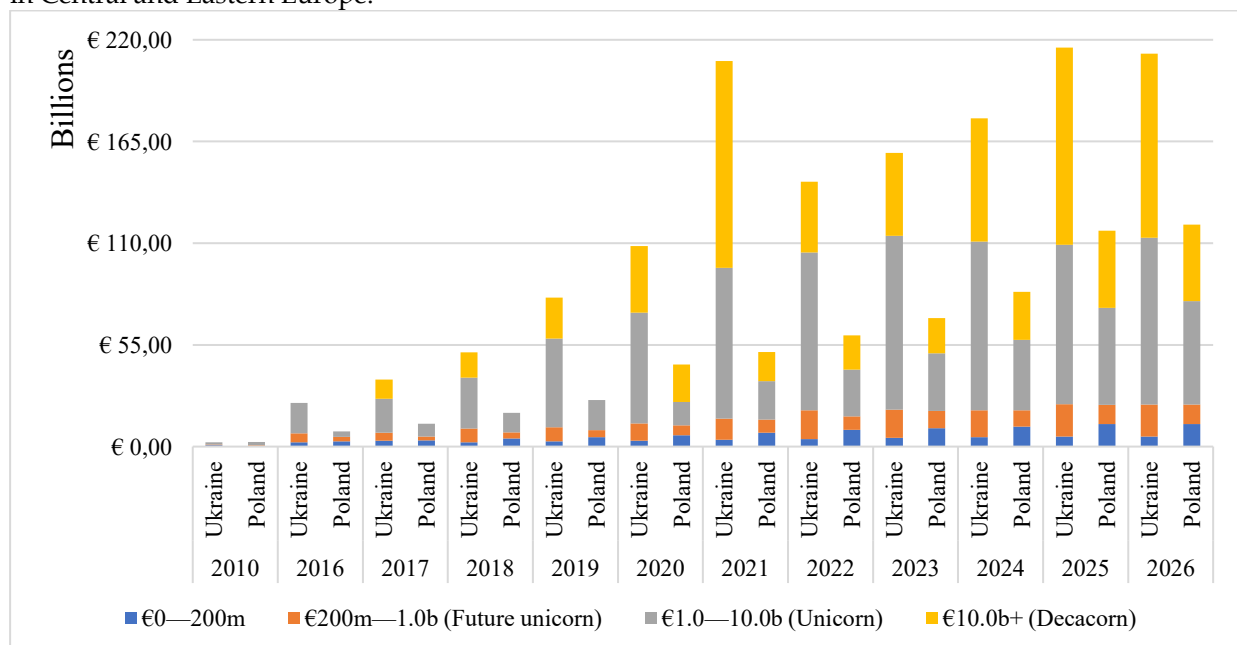


Fig. 7. Estimated value of start-up companies in the IT sector in Ukraine and Poland in 2010–2026

Source: [14, 15]

The innovative activity of Ukrainian IT companies and startups is not limited to software development and the promotion of new technologies—it also forms the basis for the implementation of modern corporate management and control standards.

The transformation of the modern business environment under the influence of globalization and digitalization makes the implementation of compliance systems in the IT sector a pressing issue. This

ensures the institutional compliance of corporate structures with the global legal order, covering not only the legal sector, but also the ethical and regulatory sectors, which are important aspects of the functioning of organizations. The active use of information technologies and the implementation of cross-border operations require compliance with international regulatory compliance in the field of information security, in particular such requirements as GDPR, ISO/IEC 27001, PCI DSS, etc. (Table 2). Ukrainian IT companies pay considerable attention to the development of technologies that contribute to improving the security of compliance systems and ensuring compliance with international regulatory requirements.

Table 2

**International requirements and standards in the field of information security**

Name	Full name	Scope of regulation
GDPR	General Data Protection Regulation	Confidentiality and protection of personal data of individuals residing in the European Union. Applies to any company that processes data of EU residents.
PCI DSS	Payment Card Industry Data Security Standard	Security of payment transaction data. Mandatory for all organizations that process credit card data.
ISO/IEC 27001	International security standard (ISO/IEC 27001)	The most widely used international information security standard, which regulates data security, cyber protection, and incident management.
NIST Cybersecurity Framework	NIST Cybersecurity Framework (USA)	A model for assessing cyber risks and implementing controls to protect IT infrastructure.
SOC2	Report on controls in a service organization (System and Organization Controls 2)	Audit standard for service providers (cloud, SaaS) confirming an adequate level of security, availability, confidentiality, and privacy of data
EU AI ACT	Report on management in a service organization (System and Organization Controls 2)	The first comprehensive law on Artificial Intelligence, introducing risk-based classification of AI systems, requirements for security, transparency, and governance
HIPAA	Health Insurance Portability and Accountability Act	A US law that sets standards for the protection of medical records and patients' personal medical data.

Source: compiled by the authors based on data from [16]

In the Ukrainian context, compliance in the field of information security is mandatory, in particular for critical infrastructure facilities and companies working with sensitive or large amounts of data. Failure to comply with the requirements of the Law of Ukraine "On the Protection of Personal Data" and other regulatory norms can lead to significant financial costs, lawsuits, and reputational damage [17].

The role of Ukrainian IT companies in the field of compliance is to create a technological foundation for compliance with international regulatory requirements for information security. By providing services for the development of software solutions and the digitization of control functions, they contribute to the improvement of the integration of security components into internal business processes with the international legal field in the field of information protection.

In particular, EPAM Ukraine, SoftServe, GlobalLogic Ukraine, DataArt, and Intellias specialize in developing secure corporate information systems that comply with ISO/IEC 27001, GDPR, SOC 2, and PCI DSS standards. As part of these projects, EPAM Ukraine, SoftServe, and GlobalLogic Ukraine are implementing platforms for cyber risk management, automation of RegTech solutions (risk assessment for large custodian banks), and development of comprehensive AI Governance structures that help companies integrate AI in compliance with ethical standards and data protection requirements [18,19,20]. DataArt creates information systems that meet the requirements of the international HIPAA standard for medical data management, while Intellias specializes in developing data management systems for European telecom operators for secure business process outsourcing [21,22].

Ajax System, which combines software and hardware solutions for physical security, plays a particularly important role in ensuring compliance security. The use of its technological solutions for the protection of critical infrastructure facilities and access control systems allows organizations to comply with strict regulatory requirements, minimizing the risks of unauthorized interference and ensuring the stability of critical systems [23].

Today, failure to comply with information security regulations leads to penalties and sanctions (Table 3), reputational damage, and lawsuits. To avoid lawsuits, companies must report serious attacks in their annual reports, develop data protection strategies, and report security breaches to the competent authorities. In the event of a cyberattack, companies must respond quickly to breaches of their security systems to protect their customers' personal data and try to quickly resolve all issues related to the breach.



Table 3

**Penalties and sanctions for non-compliance with international requirements and standards in the field of information security**

Regulation	Jurisdiction	Amount of fine
GDPR	EU	Up to 4% of annual revenue or €20 million (whichever is greater)
HIPAA	United States	Up to \$1.5 million per year
Personal Data Protection Act	Ukraine	0.5% - 1% of total annual turnover
PCI DSS	USA	From 5,000 to 100,000 per month

Source: compiled by the authors based on data from [24]

To protect their systems, IT companies must implement a number of new preventive measures, namely: use of multi-factor authentication and granting access to data only when necessary, encryption of data during transmission and storage, implementation of centralized log collection and control of their integrity, regular vulnerability assessments and penetration testing, creation and updating of security incident response plans, training employees to recognize phishing and social engineering, organizing automatic real-time compliance monitoring, establishing clear procedures for working with suppliers and third parties [25,26].

### RESEARCH CONCLUSIONS

In the context of military challenges, effective management of competitive advantages has become critical for the survival and further development of Ukrainian IT companies. The Ukrainian IT sector has shown extraordinary resilience, adaptability, and flexibility, forcing company management to make new strategic decisions and undergo constant transformations. The main factors ensuring competitiveness in the international arena are: retaining highly qualified human capital, strengthening investment flows and the capacity for innovation, despite the uncertainty that Ukrainian companies faced at the beginning of the full-scale invasion. The future development strategy for Ukraine's IT sector should focus on integration into global technology chains, increasing innovation potential, and developing new markets and customer bases.

Compliance in the field of information security is an integral part of the modern IT enterprise management system, especially in the context of global digitalization of business processes and growing regulatory requirements in the areas of data protection, financial transparency, and information security. The role of technology in the functioning of compliance systems is evident in the continuous monitoring of the operating environment and the strengthening of organizations' cyber resilience. Ukrainian IT companies make a significant contribution to this process, realizing their potential through the development of specialized software and the implementation of cyber protection protocols that minimize strategic and regulatory risks. Compliance in the field of information security should be viewed not only as a tool for formal compliance with national and international norms and rules, but also as a strategic management element that contributes to the sustainable development of Ukrainian companies, increases their competitiveness in the global market, and facilitates their integration into the global economic space.

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## КОНКУРЕНТНІ ПЕРЕВАГИ ІТ-СЕКТОРУ УКРАЇНИ В УМОВАХ ВІЙНИ

ТУНІЦЬКА Юлія, ОСИПОВА Софія, КОВАЛЬЧУК Андрій  
Державний торговельно-економічний університет

У статті здійснено поглиблений аналіз особливостей формування, збереження та реалізації конкурентних переваг ІТ-сектору України в умовах повномасштабної війни та тривалої соціально-економічної нестабільності. Обґрунтовано, що ІТ-галузь залишається одним із найбільш стійких і стратегічно важливих секторів національної економіки, який, попри воєнні ризики, забезпечує стабільні валютні надходження, збереження зайнятості, високий рівень інтеграції у глобальні цифрові ланцюги створення вартості та підтримку міжнародної конкурентоспроможності України.

Проаналізовано динаміку та структуру експорту ІТ-послуг, що дало змогу виявити стійку тенденцію до зростання їх частки у загальному обсязі експорту послуг та визначити ключові ринки збуту, зокрема Сполучені Штати Америки та країни Європейського Союзу. Доведено, що визначальною конкурентною перевагою ІТ-сектору в умовах воєнної нестабільності є наявність висококваліфікованого людського капіталу, який характеризується значним рівнем технічних компетенцій, високою адаптивністю, досвідом роботи в міжнародних проєктах та достатнім рівнем володіння іноземними мовами, поєднаними з відносно нижчим рівнем оплати праці порівняно з провідними світовими та європейськими економіками.

Виявлено унікальну здатність українського ІТ-бізнесу до прискореної капіталізації, операційної стійкості та швидкої трансформації бізнес-моделей в умовах постійного впливу деструктивних наслідків військової агресії, збоїв логістики, інфраструктурних обмежень і макроекономічної невизначеності. Особливу увагу приділено ролі стартап-екосистеми, аутсорсингових і змішаних моделей діяльності, які забезпечують гнучкість, інноваційність і здатність швидко реагувати на зміни глобального ринку.

Окремо розглянуто питання дотримання міжнародних стандартів регуляторного комплаєнсу у сфері інформаційної безпеки як важливого чинника формування конкурентних переваг на світовому цифровому ринку. Узагальнено досвід українських ІТ-компаній щодо впровадження міжнародних вимог і стандартів захисту даних та кібербезпеки, зокрема GDPR, ISO/IEC 27001, PCI DSS, SOC 2 та інших. Обґрунтовано, що комплаєнс у сфері інформаційної безпеки слід розглядати не лише як інструмент формального дотримання норм, а як стратегічний елемент управління, що підвищує довіру міжнародних партнерів, знижує регуляторні та репутаційні ризики й сприяє довгостроковому сталому розвитку ІТ-сектору України в умовах війни та післявоєнного відновлення.

Ключові слова: ІТ-сектор України, експорт ІТ-послуг, кадровий резерв, ІТ-компанії, аутсорсинг, військова агресія, цифровізація, стартап, ІТ-фахівці, комплаєнс у сфері інформаційної безпеки, міжнародні вимоги і стандарти, розробка інформаційних систем, санкційні заходи.