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## STARTUP INTERNATIONALISATION AND THE DEVELOPMENT OF THE UKRAINIAN STARTUP ECOSYSTEM AS A DRIVER OF INNOVATION-LED GROWTH

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The article examines the impact of digitalisation on the internationalisation of startups and the development of the Ukrainian startup industry, with a view to establishing the preconditions for innovation-led growth of the national economy. The main directions of influence and the associated organisational and technological instruments are identified. A generalised systematisation of the effects of digitalisation is carried out according to the following scheme: directions of influence, instruments of influence within each direction, and variants of these instruments. This approach enables a systematic analysis of performance and the identification of shortcomings and problems associated with the instruments of influence, thereby providing a sound basis for developing measures to enhance the effectiveness of utilising their potential to ensure the successful promotion and scaling of Ukrainian startups in international (global) markets. An analysis and evaluation are conducted, based on the proposed criteria, of the prospects for forming innovation growth poles in the Ukrainian economy and its sectors, grounded in startups that have successfully scaled in international markets. The results indicate that the greatest prospects lie in startups within segments of the startup industry that create preconditions for the innovative development of the IT sector and the defence-industrial complex (DIC), including related industries. It is demonstrated that, under conditions of digitalisation, the IT sector and the defence-industrial complex become key drivers of post-war recovery and innovation-led growth of the Ukrainian economy. The findings, taken together, contribute to the advancement of innovation management, particularly in terms of developing an information and analytical framework for managing the internationalisation of startups (as a form of innovative business), as well as for identifying promising directions of innovation-led growth of the national economy initiated by startups in the context of digitalisation. Further research should focus on developing the foundations of an organisational and economic mechanism for managing, based on digitalisation, the development of the Ukrainian startup industry as a driver of post-war recovery and innovation-led economic development, including within the framework of the concept of innovation-driven catch-up development.

**Keywords:** digitalisation, digital technologies, startup internationalisation, startup ecosystem, innovation growth poles, national economy, innovation-led development.

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**Startup internationalisation and the development of the Ukrainian startup ecosystem as a driver of innovation-led growth**

### ***Introduction and problem statement***

The formation of the digital economy is accompanied by the digital transformation of business models and business processes, as well as their transition into a virtual environment. Digital technologies are being implemented across virtually all sectors of the economy, driving innovative changes in production and service delivery systems and management methods, while expanding the range of opportunities for adaptation- and innovation-driven development of economic entities at different levels and across industries. In particular, digitalisation has ensured the functioning and development of Ukraine's national economy during the COVID-19 pandemic and the war with Russian aggression.

Digitalisation also contributes to the development of Ukrainian startups as an innovative business model, creating the preconditions for innovation-led growth of the national economy and its sectors. However, high business risks in Ukraine, a shortage of investment resources, and the loss of part of the national startup ecosystem's potential caused by war and economic instability constrain the scaling of even promising startups within the domestic market. At the same time, global practice demonstrates that digitalisation facilitates overcoming national boundaries and enables utilising opportunities within the international business environment, including global and regional startup ecosystems.

In this context, the problem arises of digitalising the management system for the promotion and scaling of domestic startups in international markets, i.e. their internationalisation. Addressing this problem will help lay the groundwork for innovation-driven development of Ukraine's national economy and its sectors through digitalisation.

### ***Analysis and research of publications***

The issues addressed in this article have been examined by a number of scholars. Smahliuk and Kondrat [15] analysed the impact of digitalisation on economic growth. They identified several ways in which digitalisation influences startup development, including the introduction of new business models, support for startup creation, the stimulation of new startup sectors, support for digital startups, participation in international digital projects, and scaling in international markets. Mykhailenko and Pashchenko [10] examined current trends in startup development within the international business environment. They analysed the digital technologies used by successful startups. They emphasised the role of digital technologies in ensuring startup success in international markets, particularly through facilitating global communication with partners, enabling innovative

digital business models, supporting technological innovation and the creation of new markets, providing access to international markets, and enabling access to international investment via digital platforms. Oliinyk [12] analysed the directions of digital transformation that will help transform Ukraine into a global hub for defence technologies. It identifies measures aimed at developing the domestic startup ecosystem, including institutional support for venture funds, the provision of public services through the Diia.AI portal, the organisation of startup competitions (in defence and high-tech sectors) with funding for winners, the introduction of Ukrainian startups to foreign investors and their involvement in cooperation, and state support for AI-based startups. Semykina et al. [14] investigated the impact of digitalisation on the development of intellectual business (including startups) in Ukraine and globally. They examined the impact of digital transformation on national startup ecosystems and highlighted limitations faced by Ukrainian startups, particularly in accessing funding sources and international markets. Melnyk et al. [9] analysed the impact of Industry 4.0 information and communication technologies (ICT) on the development and scaling of small and medium-sized enterprises engaged in export–import activities. They proposed an approach to forming an adaptive production system based on Industry 4.0 ICT, enabling rapid adaptation to external environmental changes. Diuhovanets [3] analysed the specifics of startup promotion in the digital economy, focusing on digital technologies for optimising startup development processes, the application of digital marketing tools and methods, and the use of digital analytics alongside the development of digital competencies within startup teams to improve management effectiveness. Lytvyn and Pauk [8] examine the impact of digitalisation on accelerating startup internationalisation, understood as the process of entering and scaling in international markets. They note that digitalisation enhances awareness of target-market trends and actors, optimises startup creation and commercialisation processes, increases access to global investment markets, and accelerates startup promotion to international markets through network technologies. Yanenkova [19] analysed the prospects for national economic development based on digitalisation, highlighting opportunities such as participation in European digital innovation hubs, which facilitate integration into European innovation ecosystems and entry into international markets. Bigliardi et al. [1], based on a literature review, examined the role of digitalisation in ensuring the growth and success of digital startups, emphasising the leading role of Industry 4.0 ICT in

enhancing competitiveness and supporting startup growth, as well as their influence on the formation of startup business models. Vadana et al. [18] substantiated the dependence of company internationalisation (in terms of the efficiency of foreign assets) on the degree of use of internet infrastructure and digital technologies. They proposed a classification of internationalisation based on the level of digitalisation of value chains. Ruggieri et al. [13] investigated the evolution of business models emerging from innovative and dynamic companies operating via online platforms. They compared the business models of 15 Italian startups, identifying key similarities and differences, and demonstrated the potential of digital platforms for scaling startups offering innovative products and services. Nagy et al. [11] examined the mechanisms enabling rapid scaling for technology startups based on digital platforms, identified key factors influencing their growth, and proposed recommendations for entrepreneurs seeking to support scalable startup development.

Based on the literature review, prior research has identified the key impact of digitalisation on the development of the startup industry. Both domestic and international practices of startup project management across various sectors in the context of the digital economy have been analysed. The positive impact of digital technologies on accelerating startups' entry into and scaling within international markets, as well as on ensuring their market success, has been highlighted. However, existing studies address only selected aspects of the problem of using digital tools and methods for the internationalisation of Ukrainian startups. This limits the full utilisation of the potential of digital technologies to promote and scale Ukrainian startups in international markets and constrains the development of Ukraine's startup ecosystem as a driver of innovation-led growth of the national economy.

#### ***The purpose of the article***

This article aims to examine and systematise the effects of digitalisation on startup internationalisation and the development of the national startup ecosystem as a driver of innovation-led growth of the Ukrainian economy.

To achieve this aim, the following research objectives are defined:

- to identify the directions of influence of digitalisation on the promotion and scaling of startups in international markets (startup internationalisation);

- to determine the instruments influencing startup internationalisation within the identified directions of influence;

- to assess the prospects for the formation of innovation growth poles in the Ukrainian economy

and its sectors, based on startups that have successfully scaled in international markets.

#### ***Main material***

Building on the analysis of academic and analytical sources, the main directions of digitalisation's impact on the internationalisation of startups are identified. For each direction, a set of instruments of influence is defined, and variants of their practical application (primarily in the domestic context) are examined. In accordance with the proposed scheme (directions → instruments → variants), the effects of digitalisation on startup internationalisation and the development of the startup ecosystem are systematised.

First. Implementation of new digital business models for startups. These models are oriented towards scalability, personalisation of customer interaction, data-driven decision-making, and adaptation to changes in the external environment. The key models include:

- digital platforms (marketplaces), which create a digital environment for interaction between sellers and consumers: Preply – an educational platform connecting language tutors with learners; Grammarly – a platform for improving written communication;

- prepaid services, particularly the provision of access to software via the Internet (Software as a Service, SaaS): SalesDrive – a CRM software package for e-commerce, integrated with digital telephony, delivery services (e.g. Nova Poshta), and marketplaces (e.g. Rozetka);

- subscription model, involving regular payments for time-limited access to content, services, or products: Headway – a startup offering an application with condensed versions of books and educational courses (microlearning products), accessible via subscription;

- freemium model, where the basic product is provided free of charge, while advanced features require payment: Dropbox – offers free cloud storage (with limited capacity), which can be expanded on a paid basis;

- direct-to-consumer (D2C), involving the direct sale of products to consumers without intermediaries: Releaf Paper – produces paper from fallen leaves and works directly with corporate customers; DressX – a retailer of digital clothing and accessories offering virtual items for social media, online conferences, and similar uses;

- ecosystems, defined as the integration of multiple startups into a unified network (cluster), increase their overall value for users: Brave1 – an initiative that об'єднує startups in Ukraine's defence technology sector.

Second. Support for startup creation and scaling:

- a strong Ukrainian startup ecosystem, which is dynamically developing [16], has among the most advanced digital infrastructure in Europe;

– a well-developed startup sector (as a component of the startup ecosystem), comprising approximately 2,600 active startups [12], with its key segments, particularly FinTech, AI, EdTech, and DefenceTech, oriented towards global markets;

– a strong IT sector, ranked among the top globally in terms of competitiveness [2]. It contributes to the technological foundation of the startup ecosystem, creates conditions for the development and validation of digital startups, supports their commercialisation and internationalisation, and fosters the innovation-driven development of the country's startup ecosystem [5].

Third. Information and communication support for startup internationalisation. This support is provided through the following elements:

– the Ukrainian startup ecosystem, which facilitates the establishment and maintenance of connections (through ICT) with domestic and international institutions, thereby supporting the information and communication aspects of internationalisation for startups [12]. It ensures a high level of implementation of startup support standards (e.g., the ESNA initiative) and the availability of advanced digital services (e.g., Diia.Business) [16];

– Diia.Business portal that provides information on potential partners for startup projects, current offers and demands, grants, legal aspects of startup management as an innovative business, and export opportunities [16];

– integration into international networks, in particular participation in the EU initiative EU4Digital, which promotes the exchange of advanced ICT practices and facilitates access to EU markets for startups from the Eastern Partnership region. Its programme EaPConnect supports ICT innovation, enables cooperation among research and educational communities through broadband infrastructure, and provides access to digital services and global research [4];

– international events facilitating contacts with potential partners, including international delegations organised by the Ukrainian Startup Fund [17], which provide opportunities for Ukrainian startups to present themselves at global technology exhibitions, pitch their projects to investors, and establish cooperation with international partners;

– digital platforms for partner search at various stages of startup development and commercialisation (global and regional, including European). These include the Digital Europe Matchmaking Platform, which simplifies partner search for calls under the Digital Europe Programme and facilitates the formation of consortia for startup projects (also described via Diia.Business). Platforms such as the Ukrainian Business Embassy support entry into specific markets,

including the United States;

– social media and online communities, which serve as channels for identifying potential partners, including DOU and Reddit.

Fourth. Access to financial resources:

– digital platform of the Ukrainian Startup Fund, which provides grants and access to investor networks, including through cooperation with Microsoft for Startups;

– digital crowdfunding platforms, which enable fundraising from a large number of contributors, including international platforms such as Kickstarter and Indiegogo, as well as Ukrainian platforms such as RazomGo, StartEra, and Big Idea;

– grant and financial digital platforms providing funding for startup projects, including Seeds of Bravery, which supports the Ukrainian technology ecosystem and facilitates the integration of high-tech startups into European networks;

– digital platforms for investor search and investment access, including: Startup Network – connecting startups with investors; OpenVC – facilitating access to venture funds; Gust – enabling interaction with business angels; AngelList – a global network connecting startups with venture capital and angel investors; PitchBook – a platform for capital market analysis and strategic partner search; InVenture – a Ukrainian platform providing project databases and market analytics for investors;

Fifth. Access to acceleration programmes and global expansion:

– digital acceleration services, including: Challenger AI – an online AI-based startup acceleration programme; IdeasLab – a Ukrainian online accelerator for students; Tech Driven Growth – an online accelerator for women entrepreneurs; BeFounder Ukraine Edition – an accelerator supporting entry into EU markets.

– the digital public service Diia.Business, which offers export support programmes and provides access to international accelerators.

– cloud platforms, particularly Microsoft Azure, enable global access to digital services and support the scaling of digital startups.

– online mentoring platforms, supporting strategy development, networking, knowledge exchange, and scaling, including: EIT Founders2Founders – supporting Ukrainian startups in entering and scaling in European markets; Prometheus – providing support at all stages of startup development and scaling.

– digital platforms providing access to global communities, including 500 Global.

– integrated international systems, such as Microsoft Dynamics and Salesforce, facilitate startup scaling in international markets.

– remote mentoring support is delivered online via platforms such as Zoom, Google Meet, and Microsoft Teams.

The results of the systematisation form an information and analytical basis for a digitalisation-driven management system for internationalisation of startups and for the development of the startup

ecosystem as a driver of innovation-led growth of the national economy.

In this context, an assessment is carried out of the prospects for the formation of innovation growth poles in the sectors of the Ukrainian economy, based on startups that have successfully scaled in international markets (Table).

Table

**Sectors of the Ukrainian startup ecosystem with high potential for the formation of innovation growth poles**

Startup ecosystem sector	Criteria indicating the formation of innovative growth points in sectors			Innovation growth poles	
	Demand for innovative solutions	Presence of unicorns / high-growth startups	Startup scaling (current level or prospects)		
Defence technologies and dual-use technologies (DefenceTech)	Continuously growing demand [6], significantly accelerated due to recent geopolitical conflicts in the Persian Gulf region	UForce – autonomous combat systems for air, sea, and land applications [7]	Increasing practice of establishing joint ventures with European countries	Defence-industrial complex (DIC) and related industries; IT	
High technologies (DeepTech), excluding DefenceTech	Artificial Intelligence (AI)	Growing demand for AI-based decision-making systems	Grammarly – writing improvement; People – sales analytics	Clients include both individuals (Grammarly – 10 million daily users) and global companies (People)	IT, management, marketing
		Increasing role of international communication	Preply – foreign language learning (approx. 50 languages)	Clients in over 180 countries worldwide	IT, non-formal education
	Programming	Need for business process automation	Creatio – AI-based no-code business management systems	R&D centre in Ukraine, offices globally, headquarters in the USA	IT, business management
		Need to simplify software development	GitLab – automation of the full software lifecycle	Clients include thousands of companies worldwide; staff across 50+ countries	IT
		Growing demand for subscription-based cloud solutions	SaaS models used by Grammarly, Preply, Creatio and others	Ukraine ranks 2nd in Eastern Europe and 17th globally in SaaS [16]	IT, startup ecosystem
	Cybersecurity	Increasing demand for cyber protection in the context of digitalisation and hybrid warfare	LetsData (reputation protection); UnderDefense (IT infrastructure security) – not unicorns	Rapid growth of the sector	IT, business cybersecurity
	Quantum computing	Demand for solving highly complex problems beyond current computing capabilities	Haiqu – software for improving quantum computing performance (not a unicorn)	Early-stage but highly	Potential for transformative impact in science, industry, cybersecurity, AI
SEO and digital marketing	Growing demand for digital marketing tools	Ahrefs – near-unicorn, global leader in the sector	Widely used worldwide	Digital marketing across industries, IT	
Financial technologies (FinTech)	Demand for accessible banking services regardless of time and geography	Monobank – mobile-only bank	Large user base in Ukraine; expansion to European markets (UK, Poland)	Mobile banking (neobank model)	
	Demand for simple financial accounting tools for SMEs	Finmap – financial flow management (not a unicorn)	Used by 4,000+ SMEs in 30+ countries; received Google investment	SME financial management	
Medical technologies (MedTech)	Growing demand for prosthetics due to war-related injuries	Esper Bionics – AI-based bionic prosthetics (not a unicorn)	Offices in Lviv, New York, Berlin; primary market – USA	Bionics, prosthetics	
	Need for fast search and delivery of medicines	Liki24 – medicine search, price comparison, ordering, delivery (AI-based)	Active scaling; Liki24.Global; 2.5+ million users in 50 countries	Pharmaceuticals, medicine access	

Source: developed by the authors

Innovation growth poles are understood as sectors, industries, or service systems in which new knowledge, innovations, human and material resources are concentrated, thereby creating conditions for innovation-led growth. The assessment is based on the results of qualitative analysis. The analysis is conducted across the sectors of the Ukrainian startup ecosystem.

Based on Table, the following conclusions can be drawn:

Most of the analysed startups contribute (or have contributed) to the formation of innovation growth poles in the IT sector. With the development of the startup ecosystem, IT is no longer solely a service provider. However, it increasingly generates complete, innovative products, including software applications, platforms, and integrated hardware–software systems for various purposes. In particular, these solutions address challenges in cybersecurity, business management (including management, marketing, and finance), and education within the framework of lifelong learning, which is especially relevant in the context of Industry 4.0 and the development of the digital economy.

Innovation growth poles are actively emerging in the defence-industrial complex (DIC) and related industries that ensure its functioning (including the supply of raw materials, components, and ICT services). This is facilitated by the effective use of innovative military technologies and combat systems in the war against Russian aggression. Demand for such technologies is steadily increasing, both from the Armed Forces of Ukraine and other defence institutions, as well as from foreign customers. Many of these technologies also have potential applications in the civilian sector.

Startups in the FinTech and MedTech sectors also demonstrate strong potential to form innovation growth poles. In FinTech, for example, Monobank has been actively used by volunteers and organisations supporting the Armed Forces of Ukraine and war-affected populations. In the MedTech sector, Esper Bionics is particularly relevant given the growing demand for prosthetic solutions among both military personnel and civilians. However, challenges related to scaling and financing remain. For instance, in the United States, prosthetic services, including those offered by such startups, are often financed by insurance companies.

Other startups identified in Table also demonstrate significant medium-term potential, including Haiqu (quantum computing).

### **Conclusions**

The study identifies the main directions of digitalisation's influence and, within these, the corresponding instruments affecting startup internationalisation and the development of the Ukrainian startup ecosystem. A generalised systematisation is carried out according to the scheme: directions of influence → instruments → variants of instruments applied in domestic practice. This systematisation enables a structured analysis of the effectiveness of these instruments, facilitates a more comprehensive utilisation of their potential to promote and scale Ukrainian startups in international markets, and supports effective management of the development of the startup ecosystem.

A qualitative analysis and evaluation are conducted, based on the proposed criteria, of the prospects for the formation of innovation growth poles in the Ukrainian economy and its sectors, grounded in startups that have successfully scaled in international markets. The findings indicate that the most promising sectors of the startup ecosystem are those contributing to the innovative development of the IT sector, as well as the defence-industrial complex and related industries. It is demonstrated that IT and the DIC are effectively becoming key drivers of innovation-led growth of the national economy under conditions of digitalisation.

The results contribute to the development of innovation management, particularly by establishing an information and analytical framework for managing startup internationalisation as an innovative business, supporting the development of the startup ecosystem, and identifying promising directions of innovation-led growth initiated by startups.

Further research should focus on developing the foundations of an organisational and economic mechanism for managing startup internationalisation and, on this basis, the development of the Ukrainian startup ecosystem, in order to ensure conditions for post-war recovery and innovation-led development of the national economy, including within the framework of the concept of innovation-driven catch-up development.

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**ВПЛИВ ІНТЕРНАЦІОНАЛІЗАЦІЇ СТАРТАПІВ НА РОЗВИТОК СТАРТАП-ІНДУСТРІЇ УКРАЇНИ ЯК РУШІЙНОЇ СИЛИ ІННОВАЦІЙНОГО ЗРОСТАННЯ НАЦІОНАЛЬНОЇ ЕКОНОМІКИ**Ілляшенко С.М., Шипуліна Ю.С., Ілляшенко Н.С.,  
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Статтю присвячено дослідженню впливу цифровізації на інтернаціоналізацію стартапів і розвиток стартап-індустрії України в контексті формування передумов інноваційного зростання національної економіки. Визначено основні напрями впливу і сукупності засобів (організаційних та технологічних), що їх реалізують. Виконана узагальнена систематизація впливів цифровізації за схемою: напрями впливу, засоби впливу в руслі кожного з напрямів, варіанти засобів. Це дозволяє системно аналізувати результативність та визначати недоліки і проблеми засобів впливу, обґрунтовано формувати заходи щодо підвищення ефективності реалізації потенціалу зазначених засобів для забезпечення успіху просування і масштабування українських стартапів на міжнародних (глобальних) ринках. Виконано аналіз і оцінювання за запропонованими критеріями перспектив формування на базі стартапів, що успішно масштабуються на міжнародних ринках, точок інноваційного зростання економіки України і її галузей. За їх результатами встановлено, що найбільші перспективи мають стартапи секторів стартап-індустрії, які формують передумови інноваційного розвитку галузей ІТ та військово-промислового комплексу (ВПК), включаючи суміжні з ним галузі. Показано, що в умовах цифровізації ІТ і ВПК стають рушійною силою повоєнного відновлення і інноваційного зростання економіки України. Отримані результати у сукупності розвивають засади інноваційного менеджменту, зокрема, в частині формування інформаційно-аналітичної бази для управління інтернаціоналізацією стартапів (як формою інноваційного бізнесу), а також для визначення перспективних напрямів інноваційного зростання національної економіки, які ініційовані стартапами, в умовах цифровізації. Подальші дослідження повинні бути спрямованими на формування засад організаційно-економічного механізму управління на засадах цифровізації розвитком стартап-індустрії України як рушійною силою повоєнного відновлення і інноваційного розвитку її економіки в т.ч. у руслі концепції інноваційного випередження.

**Ключові слова:** цифровізація, цифрові технології, інтернаціоналізація стартапів, стартап-індустрія, точки інноваційного зростання, національна економіка, інноваційний розвиток.

**STARTUP INTERNATIONALISATION AND THE DEVELOPMENT OF THE UKRAINIAN STARTUP ECOSYSTEM AS A DRIVER OF INNOVATION-LED GROWTH**Iliashenko Sergii<sup>a, b\*</sup>, Shypulina Yuliia<sup>a</sup>, Iliashenko Nataliia<sup>c</sup>,  
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The article examines the impact of digitalisation on the internationalisation of startups and the development of the Ukrainian startup industry, with a view to establishing the preconditions for innovation-led growth of the national economy. The main directions of influence and the associated organisational and technological instruments are identified. A generalised systematisation of the effects of digitalisation is carried out according to the following scheme: directions of influence, instruments of influence within each direction, and variants of these instruments. This approach enables a systematic analysis of performance and the identification of shortcomings and problems associated with the instruments of influence, thereby providing a sound basis for developing measures to enhance the effectiveness of utilising their potential to ensure the successful promotion and scaling of Ukrainian startups in international (global) markets. An analysis and evaluation are conducted, based on the proposed criteria, of the prospects for forming innovation growth poles in the Ukrainian economy and its sectors, grounded in startups that have successfully scaled in international markets. The results indicate that the greatest prospects lie in startups within segments of the startup industry that create preconditions for the innovative development of the IT sector and the defence-industrial complex (DIC), including related industries. It is demonstrated that, under conditions of digitalisation, the IT sector and the defence-industrial complex become key drivers of post-war recovery and innovation-led growth of the Ukrainian economy. The findings, taken together, contribute to the advancement of innovation management, particularly in terms of developing an information and analytical framework for managing the internationalisation of startups (as a form of innovative business), as well as for identifying promising directions of innovation-led growth of the national economy initiated by startups in the context of digitalisation. Further research should focus on developing the foundations of an organisational and economic mechanism for managing, based on digitalisation, the development of the Ukrainian startup industry as a driver of post-war recovery and innovation-led economic development,

including within the framework of the concept of innovation-driven catch-up development.

**Keywords:** digitalisation, digital technologies, startup internationalisation, startup ecosystem, innovation growth poles, national economy, innovation-led development.

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