**ARTICLE**

# The Digital Ecosystem as a Novel Economic Phenomenon and Legal Concept

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**Abstract.** Today's economy is undergoing a fundamental institutional shift in which digital ecosystems have emerged not only as a key driver of development but also as a critical condition for market access for billions of users. Despite the rapid global proliferation of these phenomena, the evolution of legal regulation—from e-commerce and data protection to antitrust oversight of platforms—demonstrates a lag behind the dynamics of technological development. The existing regulatory framework fails

to adequately address contemporary challenges that require comprehensive oversight of the platform economy. Traditional approaches are insufficient to address systemic integration, multi-layered control over data, and competitive dynamics of digital platforms and broader digital ecosystems. The absence of terminological consensus in differentiating key concepts such as "digital platform," "ecosystem," and "super-app" stems from the inadequacy of current economic and socio-legal theory to describe these new phenomena. The emerging legal lacunae, which fail to account for the multi-layered nature of ecosystems, pose significant risks to the protection of legally protected values. This is even more significant in the conditions of the global involvement of billions of users in digital ecosystems, where the cost of hard regulatory measures primarily risks being passed on to consumers. This article provides an analysis of the platform economy's evolution from e-commerce to digital ecosystems, alongside the adaptation process of the regulatory environment to the changes. As a key scientific and practical outcome, the article proposes new systemic definitions of a complex digital platform, a digital ecosystem, and a meta-ecosystem. The definitions are grounded in the authors' original classification of the values and characteristics related to digital ecosystems. This represents a foundational step towards filling doctrinal gaps and establishing a framework for effective legal regulation of this novel economic phenomenon, aligned with the developmental stages of the platform economy.

**Keywords:** digital ecosystem; digital platform; platform economy; digital economy; marketplace; antimonopoly regulation.

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## Introduction

The contemporary global economy is undergoing a fundamental transformation. This shift is primarily propelled by extensive digitization as integrated digital structures, often referred to as institutions, are now consolidating a broad spectrum of services. These encompass cloud computing, e-commerce, financial technologies, and artificial intelligence. Through this integration, a new institutional matrix for the market is being established. This new landscape is built upon algorithms, substantial datasets, and significant network effects. In a generic sense, it represents a new economic institution.[1]

Digital platforms, along with the integrated service complexes which they represent, are shaping a new matrix for market activities. This development signifies more than mere technological modernization. It points to a profound transformation in the fundamental models, and even the rules, governing interactions among economic agents. Furthermore, it impacts the distribution of ownership and the creation of added value. This pattern clearly aligns with a classic pattern of institutional change. More accurately, it involves new entities competing with established institutions, followed by the emergence of a stable new institutional equilibrium and its eventual adoption as standard practice. Empirical evidence supports this opinion. As of October 2025, a significant share of the global population, 6.04 billion out of 8.26 billion people were internet users, were internet users—constituting 73% of the total.[2] In developed countries, internet penetration rates are remarkably higher, reaching approximately 94%.[3] Concurrently, analytical assessments indicate that by 2030, the digital economy may contribute around 14% of the total economic activity.[4] While these figures highlight the importance of digital markets and platforms, they also indicate that the digital sphere is becoming a fundamental tool for market access and broader economic engagement. Consequently, studying the economic, socio-legal, and institutional characteristics of the digital ecosystem is of paramount importance for national economies.

Digital channels have become not merely a primary but an increasingly definitive medium for economic transactions worldwide. According to the Global Digitization & Intelligence Index (GDII) report, the digital economy is expected to amount to $26.7 trillion by the end of 2025, representing a notable 25% of global GDP.[5] The

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1 Ozcan, P., & Eisenhardt, K. M. (2009). Origin of alliance portfolios: Entrepreneurs, network strategies, and firm performance. *Academy of Management Journal, 52*(2), 246–279.

2 Kepios. (2025). Digital around the world. *DataReportal*. https://datareportal.com/global-digital-overview

3 International Telecommunication Union (ITU). (2025). *Almost three-quarters of the population are online*. https://www.itu.int/itu-d/reports/statistics/2025/10/15/ff25-internet-use/#footnote2

4 PwC. (2022). *Global business ecosystems 2030: Market size and potential*. https://www.pwc.de/en/corporate-innovation/pwc-global-business-ecosystems-2030-market-size-and-potential.pdf

5 Huawei Technologies. (2025). *Global digitalization & intelligence index (GDII)*. https://www.huawei.com/minisite/gdii/en/

investments in digital products and platform-based solutions are proving highly productive, generating $9.55 in digital product value for every $1 of expenditure.

The Russian Federation, like many other economies, increasingly treats digital platforms as significant economic institutions. They produce direct impacts and generate positive externalities across the economy. The turnover of the four largest intermediary platforms, including related services, amounted to 5.5% of Russia's GDP in 2024. This figure represents almost a threefold increase compared with 2021. Under an optimistic scenario without hard regulatory constraints, the contribution of digital platforms to the Russian economy could reach roughly 8% of GDP by the end of 2025.[6]

Digital platforms are the principal actors in this emerging economy (see the definition in Koshel et al.[7]). They appear to be undergoing what might be called the "glorious revolution," a conclusion supported by the financial results of the largest digital corporations and the evolution of their platforms. Between 2015 and 2024, Amazon led global revenue growth with a compound annual growth rate (CAGR) of 21.9%. Alphabet followed at 18.7%, and Microsoft at 11.3%. These elevated growth rates are not driven solely by product sales. Rather, they stem from control over infrastructure layers and key processes—notably cloud computing, search interfaces, and data assets.

The pattern is consistent rather than exceptional. By contrast, Apple, whose business model remains more product-centric, recorded a more moderate CAGR of 5.9% for 2015–2024. Apple's peak revenue in the period occurred in 2022 ($394.3 billion), with a slight decline to $391 billion by 2024.[8] This contrast indicates that the most rapid expansion and market influence accrue to companies that own and operate the most important technological layers of the economy: data, logistics and computational capacity.

Accordingly, the rise of the digital economy—strongly boosted by platform development—effectively constitutes the formation of a new institutional arrangement for organizing economic activity. A defining feature of this paradigm is the consolidation of multiple services and functions within a unified user interface. The "one-button" or instant-access concept offers immediate entry to a diverse set of services and thereby acts as catalysts for further digital progress.

One illustrative example that highlights the multimodal trajectory of platform development is Fulfillment by Operator (FBO). Under FBO, a platform assumes responsibility for the entire logistics chain. In alike cases the platform's role usually ceases

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[6] Kuzminov, Y. I., et al. (2025). The effect of digital platforms on the development of the Russian economy: A mathematical model of regulatory effects and empirical verification. *Voprosy ekonomiki, 7*, 5–24. (In Russian).

[7] Koshel, A. S., et al. (2025). In search of regulatory optimum for digital platforms: A comparative analysis. *Law. Journal of the Higher School of Economics, 18*(2), 4–58. (In Russian).

[8] https://www.macrotrends.net/

to be merely intermediary, however, it becomes **an indispensable infrastructural partner**. The phenomenon is both substantial and rapidly expanding. Machine-to-Machine (M2M) transactions are forecast to grow at a high CAGR of approximately 8.32%, reaching $27.41 billion by the end of 2030.[9] This trend signals that economic operations are increasingly mediated by algorithms rather than by human-to-human interaction. In e-commerce, this shift is reflected in fulfilment models: turnover in the sector is projected to reach $3.66 trillion by the end of 2025, representing more than a fivefold increase over six years.[10]

A particularly illustrative example of the ecosystem approach is the smartphone. The device combines a hardware platform, an operating system, an app store, payment and cloud services, and a network of developers. Together, these components form an ecosystem that raises consumer utility and produces powerful network effects.[11]

In practice, this example shows how consumer behaviour has become simpler and more convenient—much as shopping centres or farmers' markets once produced comparable changes in consumer behaviour. From the standpoint of institutional economics, a farmers' market represents an efficient institutional structure. It lowers transaction costs for participants by aggregating supply, reducing information asymmetry through direct interaction, and creating trust norms based on reputation mechanisms. Organized in such a way, the market establishes its own largely informal rules of exchange for the effective exchange of particular values, such as freshness and local provenance.

Likewise, a digital ecosystem operates as a centralized institutional infrastructure. By means of proprietary technical protocols and governance policies, it aggregates many participants and services, substantially reduces transaction costs and generates network effects. In so doing, it sets new rules of the game for access to digital markets and allocation of value among market participants.

For this reason, the question of how to regulate digital ecosystems is at once critical and, from the perspective of conventional legal approaches, ambiguous. Given the scale of ecosystem penetration described above, regulatory instruments become not only more complex but also costlier in terms of the potential cost of regulatory error: a single regulatory mistake may affect not only one business but the market as a whole.

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[9] M2M Communication Market. (2025). *Market research future (MRFR)*. https://www.marketresearchfuture.com/reports/m2m-communication-market-1822

[10] Statista (2025). *eCommerce – Worldwide*. https://www.statista.com/outlook/emo/ecommerce/worldwide?srsltid=AfmBOoqhqNctJG_83g_25LKm4vYDqZT8BHhyO5ahzXjLjnfPkcTK6wg4

[11] Goldsmith, B. (2014). The smartphone app economy and app ecosystems. In G. Goggin & L. Hjorth (Eds.), *The Routledge companion to mobile media* (pp. 171–180). Routledge. https://eprints.qut.edu.au/65633/22/2014-01-02_Prepublication_draft.pdf

It is worth stressing that the regulatory frameworks of Russia and of other leading economies are, to a considerable extent, lagging behind the pace of market digitalization. Advanced economic relations are already being organized within the digital sphere, yet they are frequently governed without a sufficient understanding of the specific, digital character of legal relations.[12]

The evolution of legal regulation concerning the global digital economy (and Russia is not an exception) has historically progressed through three primary stages. These stages spanned from an initial focus on e-commerce and consumer protection (2000–2011), through an emphasis on personal data protection (2011–2019), to the current third phase (since 2019). The third is characterized by the systematization of antimonopoly approaches targeting large intermediary platforms, aimed at mitigating the dominance exerted by specific platforms. The current phase of regulation does not correspond to the observable shift toward what the authors identify as a necessary fourth stage of regulation. This new stage demands the regulation of digital ecosystems as complex forms of business organization.

The disparity between reactive regulation and market dynamics is powerfully illustrated by the recent case of Meta*.[13] The US Federal Trade Commission (FTC) attempted to challenge Meta's* acquisition of Instagram** and WhatsApp. However, the court ultimately ruled that Meta* did not possess a monopoly within the social media market. Effective regulation requires an analysis of systemic integration process and control over data and competition within these relationships, rather than solely focusing on the sales-based market share of individual services. This lag occurs not only because ecosystems evolve significantly faster than their legal definitions (a phenomenon of qualitative growth). It is also because ecosystems inherently accommodate several layers of control corresponding to different markets, which ultimately influence one another.

Substantial disagreements have arisen regarding applicability of regulation to specific services integrated within the digital ecosystems of technology companies, particularly concerning their compliance with threshold values. These issues can be exemplified by disputes arising during the implementation of the European Digital Markets Act (DMA).[14] Furthermore, other examples of enforcement practice can be cited where the interchangeable use of various ecosystem terms and definitions frequently led to conflict-of-laws situations, owing to the absence of clear definitions

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[12] Koshel et al., 2025.

[13] Has been designated as an extremist organisation and prohibited in the Russian Federation by the decision of the Tverskoy District Court of Moscow dated March 28, 2022. Hereinafter, the symbol "*" shall be used to denote the aforementioned organisation, and the symbol "**" to denote services and other products owned by that organisation and prohibited in the Russian Federation.

[14] Regulation (EU) 2022/1925 of the European Parliament and of the Council of September 14, 2022 on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828 (Digital Markets Act). (2022). *EUR-Lex*. https://eur-lex.europa.eu/eli/reg/2022/1925/oj/eng

corresponding to explicit economic characteristics. Similarly, in Russian practice, the high-profile case concerning the "*koldunshiki*" (featured snippets) of the Yandex search engine highlighted the problem of abusing a dominant position and restricting competition. This restriction was achieved through the preferential display of integrated services within search results. These cases collectively underscore the critical necessity for precise legal concepts and definitions to adequately describe complex digital platforms and ecosystems.

Ill-considered, non-specific regulatory intervention carries a high risk of reducing overall welfare and suppressing the dynamic efficiency of digital ecosystems. Research findings substantiate this claim.[15,16] At the same time, these ecosystems themselves generate welfare, because they are founded upon maximizing the satisfaction of diverse user needs within each product, they generate.[17]

Specific regulatory initiatives reflect this improved understanding. Targeted regulation itself stems from a more detailed comprehension of the structure of potential problems that platforms, their products, and users may encounter. The central argument favouring a methodological approach of precise and "smart" regulation in Russia is the unique dynamic competition that persists between large digital ecosystems in the Russian market. This contrasts sharply with markets dominated by clear monopolies (such as Amazon in the USA or Tmall in China). This competition extends beyond the rivalry between the services themselves, as the core of each ecosystem is based on services of different legal nature (e.g., banks for Sber and T-Technologies; a web browser, taxi, and delivery for Yandex; marketplaces for Ozon and Wildberries & Russ; mobile communications for MTS; and a social network for VK). Targeted regulation therefore follows from a more specific understanding of the particular problems that platforms, their products and users may encounter, and this understanding is reflected in concrete regulatory initiatives.

This is the key distinguishing feature of competition between ecosystems, which is particularly evident within the Russian context. Competition between these entities centres on capturing the end consumer within a specific product segment, rather than focusing on technological leadership or favourable regulatory conditions. Financial platforms, for instance, may actively compete with transport or retail ecosystems in this struggle for market dominance. Technology significantly lowers barriers to market entry, thereby preventing absolute monopolisation. Put

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15 Petit, N., & Teece, D. J. (2021). Innovating big tech firms and competition policy: Favoring dynamic over static competition. *Industrial and Corporate Change*, 1–31.

16 Jacobides, M. G., Cennamo, C., & Gawer, A. (2023). Externalities and complementarities in platforms and ecosystems: from structural solutions to endogenous failures. *SSRN Electronic Journal*, 4601477. http://dx.doi.org/10.2139/ssrn.4601477

17 Joshi, N. H., Khan, H., & Rab, I. (2021). *A design-led approach to embracing an ecosystem strategy*. McKinsey & Company. https://www.mckinsey.com/capabilities/tech-and-ai/our-insights/a-design-led-approach-to-embracing-an-ecosystem-strategy#/

differently, digital ecosystems are beginning to occupy a substantial, leading position in their respective markets. They function as key employers, centers for Research and Development (R&D) and innovation, and significant magnets for the attraction of human capital.

This lag necessitates a transition to a new phase of legal conceptualization. The objective delay in legal regulation, which is inherently reactive, fails to keep pace with the systemic integration and multi-level control characteristic of ecosystem structures. The unprecedented scale of these ecosystems, however, is not the sole reason for the timeliness of this research. Consequently, the contemporary economy is undergoing a fundamental institutional shift, wherein digital ecosystems serve as a crucial driver of development and an integral factor governing market access. The current doctrinal deficit—specifically, the lack of terminological consensus and an adequate theoretical foundation—creates tangible risks for constitutional rights and public welfare.

The regulatory framework and future prospects (known as "legislative potential") for regulation must finally be outlined. Furthermore, a clear distinction must be drawn between ecosystems and existing legal phenomena (forms of economic activity) already regulated globally and in Russia, such as digital platforms. The aim of this article is therefore to formalize a legal definition of the digital ecosystem, taking into account the unique economic model created by these structures. The interdisciplinary nature of this study, which combines economic and legal analysis, holds fundamental importance for establishing an adequate regulatory framework in the era of digital ecosystems.

## 1. Evolution of Digital Ecosystems and Their Definitions

### *1.1. From Platforms to Ecosystems: Cases of Ecosystem Company Evolution (since 1995)*

In less than ten years, the digital economy has become a magnet for investment, a source of record profits and a significant economic institution. The growth runs at approximately 10–12% per annum, outpacing global GDP expansion and accounting for an increasing share of value added worldwide.[18] By 2028, the global digital economy is estimated to reach $16.5 trillion, representing 17% of global GDP.[19]

Rapid adoption of digital solutions by companies and individuals underpins this trend. Mobile device scale-up, higher internet penetration and the shift to cloud technologies are the primary drivers. For instance, the International Telecommunication Union estimates that 40% of the world's population was online in 2015,

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[18] UNCTAD. (2025). *World investment report. International investment in the digital economy.* United Nations. https://unctad.org/system/files/official-document/wir2025_en.pdf

[19] O'Grady, M., et al. (2024). *Global digital economy forecast, 2023 to 2028*. Forrester. https://www.forrester.com/report/global-digital-economy-forecast-2023-to-2028/RES181192

rising to 60% in 2020 and 71% in 2024.[20] As of October 2025, the number of internet users reached 6.04 billion, i.e., 73%.[21] The digital economy now becomes a core element of contemporary global rivalry.[22] Success and economic efficiency in this environment demand organizational flexibility, innovativeness and rapid adaptation to a fast-changing digital landscape.[23] The trajectory of leading digital ecosystems reveals a consistent evolution: from traditional, product-centric companies into complex, multi-domain structures. This transformation is characterized by strategic expansion beyond core competencies, integrating diverse business areas to achieve synergies and create closed-loop consumer interactions. This pattern is exemplified by the evolution of major digital ecosystems—such as Amazon in the United States, Alibaba in China, and Naver in South Korea.

Today, a digital platform is best understood as an institutional form of market organization that implements a broad range of technological capabilities enabled by an advanced digital economy. Crucially, this type of institution is private rather than state-based. Its operation is based on the expected benefits for economic agents rather than on coercion. The algorithmic revolution and cloud computing are foundational to the platform economy. Whereas software used to be embedded in physical objects, the objects themselves—both services and goods—are now woven into software-oriented networked structures.[24]

A "one-button" interface can aggregate numerous services and systems. If one counts the services accessible via a smartphone or computer in a single click, the list commonly starts at five: grocery delivery, taxi booking, ticket purchase, restaurant reservation, and bank transfers—adding contract conclusion, document signing and information search further extends the catalogue. This "one-button" capability motivates technology companies that previously concentrated on one activity to become providers of a unified interface for consumers.[25] By offering a broad assortment of products and services, firms can integrate customers into their product platform and thereby increase retention.[26]

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20 ITU, 2025.

21 Kepios, 2025.

22 Eraslan, B., & Kapan, K. (2024). Analysis of China's power, space, and technology dynamics using Peste framework. *Gelecek Vizyonlar Dergisi, 8*(2), 140–156.

23 Martín-Peña, M., Lorenzo, P. C., & Meyer, N. (2024). Digital platforms and business ecosystems: A multi-disciplinary approach for new and sustainable business models. *Review of Managerial Science, 18*(9), 2465–2482.

24 Kenney, M., & Zysman, J. (2016). The rise of the platform economy. *Issues in Science and Technology, 32*(3), 61–69.

25 Koch, M., et al. (2022). A matter of definition: Criteria for digital ecosystems. *Digital Business, 2*(2), 100027.

26 Bourreau, M., & de Streel, A. (2019). Digital conglomerates and EU competition policy. *SSRN Electronic Journal*, 3350512. https://doi.org/10.2139/ssrn.3350512

It is noteworthy that platforms create the environment that makes the aggregation of many services under a "one-button" possible for the consumer. This very fact primarily drives firms towards becoming *omnichannel* providers of goods and resources in the digital space.[27] As Hornung[28] observes, the ecosystem concept does not discard previously identified features of the digital economy; it develops them instead. Consequently, platforms play a leading role within digital ecosystems. In other words, a digital ecosystem can be defined via the digital platform concept, which this article will propose in due course. Several key advantages characterize ecosystem structures then. First, they create collective value—a complex product—by combining interdependent yet autonomous participants through a modular architecture. Second, they possess heightened innovation potential. Third, they maximize consumer utility by enabling choice and combination of products within the ecosystem.

The growth of the digital economy, driven by the rise of digital platforms, marks a fundamental shift in economic organization: the advent of the platform economy. This paradigm is characterized by the consolidation of multiple services and functions within a unified digital interface, most notably through the "one-button" concept. This integration itself becomes a catalyst for further technological progress, creating a self-reinforcing cycle of innovation. Digital ecosystems occupy a central place in implementing the "one-button" concept. These new economic institutions are integrated complexes of interconnected platforms and services. In other words, an ecosystem can be seen as a composite union of multiple services and technologies with a big "core." Thanks to reduced transaction costs and complementary innovations, these unions create conditions for scalable growth and accelerated technological development of core business elements—the "core" of a digital ecosystem.

The development and expansion of digital ecosystems should thus be regarded as a decisive factor in the future evolution of the digital economy. They enhance efficiency, accessibility and ease of use of digital technologies for a broad range of economic agents.

The prospects for ecosystem development appear promising. PricewaterhouseCoopers (PwC) forecasts that, by 2030, two-thirds of global economic activity will be concentrated within one-third of ecosystem domains.[29] The largest shares of that activity are expected in domains such as infrastructure (18%), personalized and rapid fulfilment (15%), personal wealth and legal services (14%), holistic wellbeing (13%) and adaptive development (6%). Moreover, B2B services are predicted to be the fastest-growing global ecosystem domain. These projections indicate that

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27 Hein, A., et al. (2020). Digital platform ecosystems. *Electronic Markets, 30*(1), 87–98.

28 Hornung P. (2024). The ecosystem concept, the DMA, and section 19a GWB. *Journal of Antitrust Enforcement, 12*(3), 396–437.

29 PwC, 2022.

digital ecosystems will assume an ever more important role in the global economy year by year.

Considering Russian companies that exhibit ecosystem characteristics, the largest include Yandex, Sber and MTS. According to expert estimates, by 2024 Yandex became the leader in Russia for ecosystem subscriptions, with revenues amounting to 49% of the total segment revenue that year. Sber ranked second with 19% and MTS third with 15%. The market volume of ecosystem subscriptions in 2024, per J'son & Partners Consulting, reached RUB 195 billion. This figure is 1.7 times higher than in 2023 (RUB 111.7 billion) and 3.4 times higher than in 2022 (RUB 58.1 billion).

### *1.2. Digitalisation as a New Economic Phenomenon: Scale of Development and New Added Value*

Digital ecosystems are a novel economic phenomenon, establishing themselves as independent institutions critical to competition policy. Their high market concentration is intrinsic to a strategy demanding long-term returns, driven by massive, risky upfront capital expenditures for global infrastructure.[30] These operations, unprecedented in scale and complexity, inherently carry high technical and institutional risks within a lagging regulatory framework, creating unpredictable compliance costs regarding future compatibility, data, and competition.

Economically, these high "entry" capital expenditures are the cost of creating and scaling innovation, aligning with Joel Mokyr's growth theory.[31] Applying Mokyr, infrastructure investment functions as an institutional mechanism for accumulating epistemic knowledge via big data, fueling further innovation. Initial costs are recouped, and positive effects accumulate only with a justified time lag and critical mass of data/network effects; true exponential efficiency growth occurs only at a system saturation point, where each new piece of data or transaction exponentially increases the efficiency of the entire ecosystem.

Misguided regulation destabilizes investment by increasing hold-up risks on irreversible CAPEX and future risk premiums. The complex, institutionally-defined boundaries of ecosystems (rights over data/API, logistics, partnerships) render sectoral antitrust prohibitions ineffective, a reality that future, inevitable regulation must meticulously account for.

This suggests that the regulatory strategy for ecosystems must rely on detailed, differentiated, and experimentally verified measures. This requires a precise definition of what constitutes a digital ecosystem, especially where competition between ecosystems is dynamic and multi-agent (as in Russia). If the legal definition

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[30] Liu, Y., et al. (2024). Capital investment, digital economy and innovation of high-tech industries. *International Review of Financial Analysis, 96*, 103761.

[31] Mokyr, J. (2002). *The gifts of Athena: Historical origins of the knowledge economy.* Princeton University Press.

of the digital ecosystem fails to account for the multi-faceted nature of its internal manifestations, regulation may not encompass all market participants. This failure would create a preferential position for some and exacerbate the monopoly situation. The definition currently being developed should therefore acknowledge the multimodality of the digital ecosystem, expressed as multiple sets of services operating across entirely different fields of activity. This can be explicitly underscored by referencing the classification of modularized providers, which are the elements of the digital ecosystem determining the format of its core activity and the accretion of added value.

The fact that the fine imposed for market dominance in a physical product included a non-physical aspect—advertising reach—is particularly notable. This decision highlights the risk that the unified application of turnover fines may overlook the differentiation of services and the scale of participation of various ecosystem elements in its overall activity. For instance, in 2018, the European Commission imposed a fine of €4.34 billion on Google and its parent company, Alphabet Inc., for abusing its dominant position in the Android[32] mobile device market. This penalty was calculated based on Google's search advertising turnover on Android devices within the European Economic Area, amounting to approximately 4.5% of Alphabet's consolidated global turnover for the year in question. Consequently, there is a risk of regulation being imposed on the ecosystem as a whole, even if the infringement occurred within a specific company or service. This suggests that the ecosystem possesses two "faces": the observable one (goods, services) and the unobservable one (data). Regulation often fails to distinguish between these dimensions. User data represents the key value of digital ecosystems. Algorithmic revolution, cloud computing, and user data are foundational elements of the digital economy and ecosystems; moreover, the objects and services themselves are interwoven into software-oriented network structures.

The need to revise regulatory instruments is therefore clear. Traditional price-based and structural antitrust logic must be complemented by requirements on access (portability, interoperability), rules on data ownership and use, standards for algorithmic transparency and liability for outcomes. Practically speaking, regulation should both open critical interfaces and protect incentives to invest in data collection and processing. Introducing targeted data-sharing mandates, technical standards and oversight mechanisms can help to avoid both excessive centralization and the undermining of innovation dynamics.

Unable to adequately capture competitive dynamics in the digital sector, traditional antimonopoly analysis—founded on static monopoly and market-

[32] Skadden, Arps, Slate, Meagher & Flom. (2018, July 30). *EU fines google €4.34 billion for alleged abuse of dominant position of android mobile system and apps*. https://www.skadden.com/-/media/files/publications/2018/07/eufinesgoogle434-billionforallegedabuseofdominantp.pdf?utm_source=chatgpt.com

equilibrium models—proves insufficient.[33] Growth and diversification of digital companies produce broad-based competition that crosses conventional product-market boundaries. Current market positions of these companies are not necessarily the product of immutable monopoly power. Rather, they frequently represent a temporary outcome of exploiting dynamic capabilities—the ability to reconfigure resources and operating models rapidly in response to change. Vulnerable to rapid competitive weakening, apparent dominance can be eroded by strategic missteps or delays in innovation.

To arise and function at all, a complex, multilateral structure such as a digital ecosystem must resolve fundamental coordination and cooperation problems. Relying on the basic theory of transaction costs (TCE),[34,35] one can argue that failure to solve key issues (forming a shared vision, securing participants' commitment, managing unforeseen contingencies) leads to prohibitively high transaction costs. In the absence of an active market leader, the ecosystem may simply fail to materialize. As such, high concentration and control over critical economic layers are not only the result of market success but also an institutional necessity to ensure the viability and efficiency of a complex digital ecosystem. Leadership thus acts as a mechanism for lowering transaction costs and requires specific investments together with the creation of a multilateral alignment structure.[36]

Digital companies derive rents not solely from exclusive market power but also from Ricardian sources—unique, hard-to-replicate assets such as large data sets and algorithms—and from Schumpeterian sources of innovation.[37] Consequently, regulatory policy should not focus exclusively on punishment tied to size or market share. Instead, it ought to aim at preserving dynamic efficiency and market contestability. Simplistic antimonopoly approaches carry a high risk of error: they may either suppress necessary innovative activity or misdiagnose the true sources of long-term competitive advantage. To mitigate these risks, a new evaluative methodology is required—one that accounts for the pace of innovation, companies' diversification capabilities and the role of data in value creation, while prioritizing support for innovation and long-term consumer welfare.

Viewed as technologically and informationally linked aggregates, digital ecosystems consist of services operating across entirely different domains—from intermediary sales and financial services to transport and cloud computing. What

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33 Petit & Teece, 2021.

34 Williamson, O. E. (1985). *The economic institutions of capitalism: Firms, markets, relational contracting*. Free Press.

35 Williamson, O. E. (1996). *The mechanisms of governance.* Oxford University Press.

36 Adner, R. (2017). Ecosystem as structure: An actionable construct for strategy. *Journal of Management, 43*(1), 39–58.

37 Petit & Teece, 2021.

unites one ecosystem with another is not sectoral affiliation but scale, institutional power and influence over the market manifested through consumer choice, rather than through dominance.[38]

As noted earlier, the absence of standardized definitions and of a clear distinction between digital ecosystems and platforms generates legal uncertainty. This uncertainty complicates the qualification of market participants' conduct and gives rise to risks of improper application of legal norms. Researchers deploy a broad spectrum of terms—platform ecosystems, business ecosystems, software ecosystems, the platform economy and the sharing economy. Yet Kenney & Zysman, as well as Schor and Cansoy[39] observe, the term "digital ecosystem," like related terms, is often used too broadly and without a precise definition.

Given the intrinsic complexity of ecosystems, indiscriminate regulatory intervention based on imprecise definitions can produce negative multiplicative effects, externalities and unpredictable secondary consequences. The absence of a common understanding of digital ecosystems hampers the long-term development of these companies. Internal services tend to conflict as the ecosystem grows—this is the principal internal constraint on their development.

Externally, the limiting factor is the lack of consensus on optimal regulatory mechanisms that balance private and public interests while recognizing ecosystems' distinctive economic nature, which differs from that of traditional market players. As Valdez-De-Leon emphasizes,[40] the shortage of adequate evaluative methods and conceptual definitions increases the risk of failure when attempting to establish digital ecosystems in practice. The complexity and heterogeneity of digital ecosystems, together with the diversity of stakeholders involved, therefore call for a tailored approach—one that departs from conventional definitions of economic institutions and software systems.

## 2. Legal Regulation of Digital Ecosystems

### *2.1. Foreign and Domestic Regulatory Practices for Digital Platforms and Ecosystems: A Phased Approach*

As noted above, legislation governing the platform economy is lagging behind technological and market developments. This is despite the unprecedented spread of digital platforms and services. It is also a consequence of the rapid pace of

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[38] Foss, N. J., Schmidt, J., & Teece, D. J. (2023). Ecosystem leadership as a dynamic capability. *Long Range Planning, 56*(1), 102270.

[39] Cansoy, M., & Schor, J. B. (2019). *Who gets to share in the "sharing economy": Understanding the patterns of participation and exchange in Airbnb*. Boston College.

[40] Valdez-De-Leon, O. (2019). How to develop a digital ecosystem: A practical framework. *Technology Innovation Management Review, 9*(8), 43–54.

technological advancement within the fourth industrial revolution and broader digitalization.

The evolution of the platform economy can be outlined in five stages. The first three of these—spanning roughly from the 1990s to the 2020s—were detailed earlier. They trace the trajectory from basic online presences and intermediary marketplaces to the emergence of digital ecosystems, i.e., business structures that integrate a variety of services. Building on this foundation, two further stages can be identified.

The fourth stage is primarily driven by the consolidation of consumer value. That value is achieved through stronger network effects and the optimization of user experience within large, integrated platforms and digital ecosystems. Competition will shift towards rivalry between these integrated entities. It will not be industry-bound. Rather, it will center on large companies that possess extensive user data. This trend can already be observed in the high-profile dispute concerning marketplace discounts, where major financial groups have put forward proposals to regulate price preferences on marketplaces by deploying their own financial products within those marketplaces.

The fifth stage will be marked by the emergence of global digital ecosystems. These are extensive digital platforms that bring together a broad and often cross-sectoral range of services. Market dominance in this phase will be determined by a materially simplified user experience and a significant expansion in the scale of available offerings.

The study previously systematized[41] the legislation on the platform economy—and the evolution of the platforms themselves—into three stages, drawing on the experience of countries with well-developed digital platform systems. That three-stage framework, however, should now be supplemented by a fourth phase that specifically addresses the regulation of digital ecosystems. This addition is of fundamental importance. The present article is concerned less with current regulatory realities and more with prospective directions for adapting the law. The focus is on economic institutions that are still forming their institutional integrity—namely, digital ecosystems and complex digital platforms.

Accordingly, the fourth phase of legal regulation should concentrate on the comprehensive governance of digital ecosystems as a distinct organizational form of business. Key tasks will include adapting competition law and norms on information and personal data protection to the specificities of the ecosystem model. It will be critically important to develop clear legal criteria that effectively distinguish—for the purposes of appropriate regulation—between intermediary platforms such as marketplaces and classifieds, complex digital platforms, and digital ecosystems.

It is precisely on the threshold of this fourth phase—when questions of delineation and regulatory scope become especially acute—that regulatory authorities across

[41] Koshel at al., 2025.

various jurisdictions are showing increased interest in digital ecosystems. Regulatory approaches differ depending on a range of factors. These include the scale of local ecosystems, socio-economic development priorities and established national approaches to regulating emerging sectors.[42] Foreign experience in regulating digital ecosystems therefore already evidences a variety of strategies. These strategies are shaped by state priorities and legal traditions and span a spectrum from promoting innovation to safeguarding national security and controlling information flows.[43]

Regulating digital ecosystems poses a substantially more complex legal challenge. This complexity stems from their innovative characteristics, which call for the development of a proactive rather than purely reactive legal toolkit.[44] The "lagging" nature of the regulatory environment is aggravated not only by uncertainty about the trajectories of technological innovation and new business models, but also by the fundamental obsolescence of traditional regulatory approaches.

Classical regulatory frameworks—those grounded in the assumptions of perfect competition and neoclassical economic models, and those focused primarily on a firm's size and market power—prove inadequate. Such frameworks are ill-suited to assess the multi-level interactions among ecosystem components, the presence of complex feedback loops, and the structural asymmetries of power that may exist within an ecosystem. They also fail to capture ecosystem strategies aimed at attracting and retaining users through price undercutting and the breadth of integrated services. An additional layer of complexity arises from the cross-border nature of digital ecosystems' operations. This transnational dimension generates legal uncertainty both for national regulators and for market participants themselves.

Against this backdrop of challenges, which demand fundamentally new paradigms of law enforcement and regulation, the analysis of foreign jurisdictions is of particular interest. Those jurisdictions were among the first to face the necessity of responding to the phenomenon of digital ecosystems and have taken initial regulatory steps. Studying their experience makes it possible to discern the early contours and principal problems of this emerging regulatory field, which we examine below.

**European Union: the gatekeeper concept**

The DMA has introduced the concept of a "gatekeeper," defined through a set of quantitative and qualitative criteria.

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[42] The Bank of Russia. (2021). *Ecosystems: approaches to regulation*. https://www.cbr.ru/content/document/file/119960/consultation_paper_02042021.pdf. (In Russian).

[43] Gulemin, A. (2024) Digital ecosystems in modern law: analysis of national and international approaches. *Elektronnoe prilozhenie k Rossiiskomu yuridicheskomu zhurnalu, 5*, 27–36. (In Russian).

[44] Kira, B. (2023). Rethinking regulation for dynamic digital ecosystems. *Network Law Review*. https://www.networklawreview.org/regulating-dynamic-ecosystems/

According to Article 3(2) of the DMA, an enterprise is considered a gatekeeper if it meets the following quantitative and qualitative criteria:

1) has a significant impact on the internal market (has an annual turnover in the European Economic Area of at least 7.5 billion euros in each of the last three financial years or has an average market capitalization of at least 75 billion euros in the last financial year and provides a key platform service in at least three member states);

2) provides a core platform service that serves as an important gateway for business users to reach end users (has more than 45 million monthly active end users established or located in the Union, and more than 10,000 annual active business users installed in the Union in the last fiscal year);

3) has a stable and long-term position in its operations or is expected to reach such a position in the near future (meets the thresholds specified in paragraph 2 in each of the last three financial years).

Article 2(2) of the DMA contains a list of core platform services: online intermediary services, online search engines, online social media platforms, video-sharing platform services, communication platforms, operating systems, web browsers, virtual assistants, cloud computing services, online advertising services. This list is not closed and can be expanded by the EU Commission on the basis of the results of ongoing investigations.

**Germany: companies of paramount significance for competition across markets**

Paragraph 19a (1) of the Gesetz gegen Wettbewerbsbeschränkungen (GWB) grants the Federal Cartel Office (Bundeskartellamt) the power to determine, by way of an order, that an enterprise is "**of paramount significance for competition across markets**" if it meets the following criteria:

1. The company has a dominant position in one or more markets.
2. The company has significant financial capabilities or access to other resources.
3. The company performs vertical integration and operates in otherwise interconnected markets.
4. The company has access to data that is important for competition.
5. The company's activities are important for third-party access to supply and distribution markets.

Paragraph 18(3a) of the GWB specifies that, when assessing the market position of an enterprise acting as an intermediary in multilateral markets, it is necessary to take into account "the importance of intermediary services of the enterprise for access to supply and distribution markets, as well as network effects and access of the enterprise to data of serious importance for competition, and data-related pressure on competition."

Section 19a of the GWB does not set quantitative thresholds, using only a qualitative assessment.

**People's Republic of China**

Currently, there is no special legislation to regulate the operation of digital platforms in China. In the field of competition law, the main regulatory act is the Anti-Monopoly Law of the People's Republic of China, adopted in 2008 (further referred to as the Antitrust Law).

The first major amendments to this law, which affect the activities of digital platforms, entered into force on August 1, 2022.

The logic of the Antimonopoly Law implies the possibility for executive authorities (in particular, the State Antimonopoly Bureau of the State Administration for Market Regulation of China, SAMR) to adopt by-laws and clarifications concerning various aspects of its application to digital platforms.

On February 7, 2021, the Guiding Antitrust Principles for the Platform Economy[45] (further referred to as the Guiding Principles) were adopted, filling the regulatory vacuum in the field of digital platforms.

According to paragraph 1 of Article 2 of the Guiding Principles, a digital platform is defined as "a form of business organization that allows various users of the platform to interact through network information technologies in accordance with the rules and with the assistance provided by a specific operator, thereby creating joint value."

In October 2021, the draft of the guidelines for the classification of digital platforms (further referred to as the "Platform Classification Principles") was released for public discussion, where the platforms were differentiated according to the main field of activity, the number of active users, and market capitalization. Notwithstanding that the Platform Classification Principles have not been officially adopted, the proposed classification is now widely used by the antimonopoly authorities.[46]

In accordance with the Platform Classification Principles, there are 6 types of digital platforms, depending on their function:

- intermediary platforms for online sales: connect people and products (for example, marketplaces),
- life support services platforms: connect people and services (travel, delivery, training, real estate rental, etc.),
- social entertainment platforms: connect people with people (instant messengers, gaming services, online broadcast services, audio-visual content access services, etc.),
- information platforms: connect people with information (news services, search services, etc.),

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[45] The State Council of the People's Republic of China. (2021, February 7). *China unveils antitrust guidelines on platform economy.* http://english.www.gov.cn/policies/latestreleases/202102/07/content_WS601ffe31c6d0f72576945498.html

[46] Xu, H. I., & Sun, Y. (2024). *Digital markets regulation handbook: China. Rules under development*. Cleary Gottlieb. https://content.clearygottlieb.com/antitrust/digital-markets-regulation-handbook/china/index.html

• financial services platforms: connect people and finance (payment platforms, online banking, online investing, etc.),

• computing services platforms: connect people and computing power (cloud services, mobile app development platforms, operating systems, etc.).

In addition, a combination of other indicators, such as the number of users, the platform function, and the ability of the platform to influence the contacts of the sellers with the consumers, allows further ranking of digital platforms:

**Super platforms:** at least 500 million users in China in the last reporting period, combining more than two platform functions, market capitalization of at least 100 billion yuan at the end of the last reporting period, platforms that can significantly restrict sellers' access to consumers/users.

**Large (dominant) platforms:** at least 50 million users in China in the last reporting period, a market-dominant platform function, market capitalization of at least 100 billion yuan at the end of the last reporting period, platforms that can significantly restrict sellers' access to consumers/users.

**Medium and small platforms:** platforms that had users in China in the last reporting period, there is a certain platform feature, platforms that can restrict sellers' access to consumers/users to some extent.

Depending on the type and size of the digital platform, it is assumed that it will have to meet various additional requirements.

In fact, the digital giants that fall under special legal regulation in the above-mentioned jurisdictions possess the economic characteristics of digital ecosystems: they provide multiple platform services and their activities include network effects, scale effects, lock-in effects, data control, and vertical and horizontal integration. The approach described above makes it possible to regulate ecosystems by setting criteria for the largest platforms in the absence of any formal definition of the concept "ecosystem." Thus, the lack of a specific definition of digital ecosystem is compensated by regulating the criteria for identifying large digital platforms that *are de facto* ecosystems.

### *2.2. Digital Ecosystems: Characteristics, Values, and Definitional Framework*

Our study has identified a significant gap—none of the legal systems examined a legal definition of the concept "digital ecosystem." The legislators chose a different approach by regulating the largest digital platforms through quantitative and qualitative criteria. The European Union uses the concept of "gatekeeper," Germany defines them as "companies of paramount significance for competition across markets," China suggests the definition "very large platform operators." These entities appear to possess all the economic characteristics of digital ecosystems, which makes it possible to regulate their activities without formally introducing and consolidating the term "ecosystem" in legislation.

The most significant change in the regulation of the platform economy is the transition from traditional antitrust control (*ex post*) to preventive regulation (*ex ante*).

The Digital Markets Act of the European Union establishes a set of obligations for gatekeepers on an *ex ante* basis, reflecting the recognition of traditional mechanisms in fast-growing digital markets with pronounced network effects as insufficient. Other jurisdictions, although they have not gone as far as radically transforming the regulatory landscape, are carefully studying the experience of the European Union. The related publications demonstrate that one of the most important tasks of implementing *ex ante* regulation is to speed up and simplify law enforcement procedures.[47] It is sufficient for regulatory authorities to establish qualitative and/or quantitative criteria that trigger the application of specific regulatory obligations and prohibitions to digital platforms. On the other hand, this is not sufficient in the context of scientific and technological progress, since it does not take into account the new phenomenon of digital ecosystems.

It should be noted that recent publications have proposed certain approaches to systematization and grouping various forms of interaction of economic agents in the process of producing and (or) selling goods and services. Global value chains (GVCs) seem to have been one of the first forms of interaction containing elements of consistency (value creation, complementarity of business results, etc.) developing since the 1950s. From the economic perspective, GVCs were primarily linear structures where value capture was strictly segmented and regulated mainly by bilateral contracts or corporate hierarchy relationships.

Gradually, under the influence of digital technologies and the noticeable complexity of final products, value chains began to penetrate from the production sphere to the spheres of trade and services, where they transformed and expanded, but at the same time maintained the fundamental criteria of consistency. As a result, researchers began to use the concept of ecosystems in various spheres, apparently in order to emphasize the scale and complexity of technological and operational connectivity (for example, innovation ecosystems, industrial ecosystems, business ecosystems, etc.).

The criteria of the business ecosystem identified earlier (joint value creation, complementarity, modularity, interdependence)[48] are inherent in almost any form of systematic interaction among economic agents that creates conditions for the most favorable position of businesses in a constantly changing environment. It should be noted that Hornung's work is pioneering in this field. At the same time, despite the fact that the author brings the concepts of business ecosystem and digital ecosystem closer together, our analysis retains a methodological distinction, although a high degree of their actual coincidence in the current context is recognized. These criteria adequately describe traditional forms of economic interaction that were primarily structured by corporate law or contractual regulation.

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47 Hornung, 2024.

48 Hornung, 2024.

The environment is changing not only due to market conditions. Under the influence of digital technologies, markets are undergoing a profound restructuring, which has direct legal and economic consequences. New economic agents (for example, marketplaces), new forms of business (for example, e-commerce), and innovative outputs (for example, digital content) are emerging. For instance, a new form of employment has appeared on the labour market, that is platform employment, which calls into question traditional labour and tax legislation. The integration of innovative forms and models of interaction not only has covered key aspects of the business ecosystem, but has also generated new, additional effects that can be attributed to the criteria of digital ecosystems. These include, first, an integrated value-generating effect, which, in an economic sense, means maximizing network effects and data complementarity leading to an increase in the value of any offer created by various system participants. Second, it is organizational and financial seamlessness, which, from a legal point of view, reflects the transition from traditional two-way contractual regulation to an algorithmic management system (governance), and is economically expressed in minimizing transaction costs through standardization and automation of interaction, ensuring a smooth transition for an external user from one type of interaction to another.

At the same time, digital ecosystems, creating a broad market vision, generate the most important externality (external positive effect), which is expressed in a fundamental change in the availability of offers and substantial reduction in two key categories of transaction costs. This applies to information transaction costs associated with searching, obtaining information, and entering transactions. An almost limitless "offer palette," aggregated and available with minimal information transaction costs, significantly expands consumer opportunities. From the point of view of economic theory, this reduction in access and acquisition costs is equivalent to an increase in the real income of the consumer. According to the concept of the Hicks[49] or Slutsky income effect,[50] this allows consumers not only to avoid traditional mark-ups, effectively expand their choice and optimize their budget, but also to actively replace less efficient traditional channels with more advanced economic solutions.

At the same time, the institutional dimension of the digital ecosystem effectiveness is reflected in the radical reduction of transaction costs for property rights. Ecosystems and their elements, being integral components of modern economic ecosystems, assume key functions in contract formation and performance and ensuring the fulfillment of obligations under transactions for the purchase and sale of goods and services. From an institutional perspective, these functions go beyond traditional

[49] Hicks, J. (1981). *Wealth and welfare: Collected essays on economic theory, 1*. Basil Blackwell.

[50] Slutsky, E. (1915). Sulla teoria del bilancio del consumatore. *Giornale Degli Economisti, 51*(1), 1–26. (In Italian).

mediation, transforming its legal understanding, since marketplaces not only bring the parties together, but also take on a significant part of the burden that in classical models would be placed directly on the participants in legal relations. Unlike traditional forms of mediation, where additional costs increase the final price or reduce revenue, digital platforms, by virtue of economies of scale, data aggregation and algorithmizing, minimize the transaction costs for property rights. This increases the transparency of transaction terms, reduces time and financial costs for conflict resolution, and enhances the effectiveness of compensation for rights violations.

Thus, digital ecosystems act as a new type of institutional intermediary that not only reduces uncertainty, but also fundamentally rebuilds the mechanisms of market functioning and the system of property rights protection, providing the effects of unprecedented accessibility and efficiency of market interactions.

These effects are determined by the following:

• First, a digital ecosystem differs from a traditional business ecosystem by the presence *of technologies (algorithms)* for the collection and analysis of personal data (including consumer preferences), for product presentation (the use of algorithms for targeted presentation of goods and services on the online showcase of a digital platform or for advertising purposes), for pricing (the use of dynamic pricing algorithms for individual goods and services under the influence of various objective, i.e. external factors[51]). Alongside with, these algorithms work to ensure that the participants in the transaction, both the producer and the platform itself, save time resources for concluding a transaction. *Technology and the seamlessness of its products are the first key values*.

• Second, there *are two or more product groups (services)*. Here we are talking about the presence of two or more digital platforms, each of them offering different products (services). For example, one digital platform provides the ability to purchase goods (an online store or marketplace), while another provides the ability to choose services (a classifieds service provider or an Internet service provider). Along with this, there may also be an option with a super-application (a complex digital platform) that combines various products (services) offered by various business elements of the group of companies.

• Third, the digital ecosystem parallels the classical business ecosystem in terms of the organizational conditions of doing business: (1) *a group of companies (holding) (an association of related parties)* or (2) *two or more companies united on the basis of a contractual partnership*.

• Fourth, the digital ecosystem is characterized *by a common database*, including depersonalized data, in order to make it easier for users to interact with various

[51] Not dependent on user behavior. This means the price cannot be individualized for a specific person. Presidential Council for the Development of Civil Society and Human Rights. (2021). *Digital transformation and protection of citizens' rights in the digital space*. https://ifap.ru/pr/2021/n211213a.pdf. (In Russian).

products and services within the ecosystem; to form targeted offers that increase demand; and to form targeted advertising. *Personal data and user behavior analysis are the second key value*.

• Fifth, *the presence (formation) of additional consumer value of being located within the digital ecosystem*: (1) a common database also allows to have common identifiers for authentication within the digital ecosystem; (2) an interpenetrating system for promoting goods, works and services, and related bonuses and preferences. *Simplifying user behavior and consumer choice is the third key value*.

So, we have identified **five signs of a digital ecosystem**:

• the presence of technologies and algorithms,

• the availability of two or more product groups (services),

• the presence of (1) a group of companies (related parties) **or** (2) two or more partner companies united on the basis of a contractual partnership,

• common user data,

• the presence (formation) of additional consumer value of being located within the CEC.

**Three key values of the digital ecosystem:**

• technologies,

• data,

• simplifying user behavior and consumer choice.

Based on the concepts, features and values, formulated above, a definition of a digital ecosystem can be proposed. **A *digital ecosystem* is a digital platform or a set of technologically and/or organizationally connected digital platforms that enables users to generate additional consumer value when purchasing goods, works, or services within the ecosystem using a consolidated database, technological and organizational solutions.** Organizational solutions that provide additional consumer value include the use of a unified authentication system, the introduction of a unified system of bonuses and preferences, and so on. Organizational solutions that provide additional consumer value include the use of a unified authentication system, the introduction of a unified system of bonuses and preferences, and so on. Technological solutions that ensure the conditions for creating additional consumer value include technological algorithms that ensure simplicity of user behaviour and consumer choice of goods, works and services, as well as a reduction in the costs or time spent on purchasing goods, works and services within a single digital ecosystem, as compared with purchasing such goods, works and services—fully or separately—outside the digital ecosystem.

Having formulated the definition of a digital ecosystem and identified its key economic characteristics, which are already widely recognized in domestic and international regulatory practice, we conclude that the concept of "ecosystem characteristics" in an economic sense can be described through various legal constructs. This divergence stems not from the identity of economic phenomena

and their legal definitions but rather from differing objectives and conditions of legal enforcement. Specifically, although the economic characteristics inherent in digital ecosystems—such as the creation of additional consumer value, the presence of network effects, a consolidated database, and complex technological solutions—may equally apply to a wide range of digital entities, their legal qualification necessitates a differentiated approach.

The distinction becomes particularly salient when comparing a digital ecosystem with a complex digital platform. For the latter, it is generally easier to demonstrate the existence of a network effect during antitrust analysis due to its single-entity nature, whereas for a digital ecosystem, which brings together numerous independent participants, an analysis of market share within specific market segments might be more relevant. Thus, despite the commonality of economic characteristics of ecosystem-ness, the legal differentiation of these phenomena is critically important for determining the regulatory regime, allocating responsibility, and targeted legal enforcement. Consequently, to eliminate potential ambiguity and ensure legal precision, there arises an urgent need for conceptualizing and defining precisely this entity—a complex digital platform.

At present, the concept of a complex digital platform is not enshrined in any legislation. Nevertheless, both for the purposes of the above-mentioned definition and for the further development of the law, there is a need to determine the contours of this technological phenomenon.

A complex digital platform should be understood as a digital platform that combines the characteristics of individual types of digital platforms.[52] A complex digital platform can also be understood as a digital platform that combines different types of products and services. The functioning of such a platform can be implemented through a super-app, which is a multifunctional (mostly mobile) software interface that integrates a wide range of services and functionality within a single user environment. This formulation emphasizes that the digital platform acts as the infrastructure core and governance mechanism that defines the contractual perimeter, while the super-app is the aggregation interface and transactional access point. From a legal point of view, this distinction is critical for determining the regulatory regime and the distribution of legal liability.

Although a complex digital platform, as an infrastructure core, can have several characteristics of a digital ecosystem and can even be an integral part of it, their legal differentiation is critical for the purposes of adequate regulation and determining their legal status. The fundamental difference stems from the level and subjects of organizational and legal integration. While a complex digital platform is a technological and functional aggregation of services managed, as a rule, by a single legal entity, a digital ecosystem, according to our definition, necessarily

[52] Koshel et al., 2025.

includes many legally or organizationally distinct entities (groups of companies or contractual partnerships) operating on the basis of a consolidated database and common technological solutions, which forms a qualitatively different legal phenomenon.

To conclude, the distinct legal treatment of what appear to be economically similar phenomena—the digital ecosystem and the complex digital platform—is not a mere academic exercise but a pragmatic necessity for robust legal frameworks. This differentiation is crucial for tailoring regulatory interventions, accurately assigning liability, and ensuring effective enforcement, thereby mitigating risks while fostering innovation within the rapidly evolving digital economy. Ultimately, precise conceptualization of both entities is a foundation for developing a balanced and forward-looking legal landscape.

### *2.3. Legislative Potential and Prospects for Regulating Digital Ecosystems in the Russian Context*

On the basis of the above-mentioned definitions of the digital ecosystem, it is necessary to clearly reflect the legislative potential and possible directions for future regulation of digital ecosystems (mainly for the Russian Federation, but essentially applicable in other jurisdictions). In our opinion, the potential refers to:

1) Maintaining market balance in the development of digital ecosystems:

• The network effect in the antimonopoly package is formulated in such a way that it puts large digital platforms in an unequal position with digital ecosystems, whose individual services (essentially digital platforms) may not meet all the three criteria of the fifth antimonopoly package. However, if all services offered by digital ecosystems are aggregated, the cumulative effect of ecosystem consolidation gives rise to a significantly higher level of market power. With the development of digital platforms, enforcement authorities and, ultimately, the legislature will have to recognize the market power arising from the aggregation of multiple services within a single ecosystem and introduce the relevant wording into the legislation.

• The activities of banking groups and bank holding companies that incorporate various businesses based on digital platforms constitute a significant distinctive feature of the domestic platform economy. In Russia, most digital ecosystems include a credit institution, and it is particularly noteworthy that two large banks have become the core elements of such ecosystems. The key element in digital ecosystem activities is the personal database, which is formed and developed through the collaboration of all elements within the ecosystem, simplifying user behaviour and consumer choice by means of targeted advertising and other features of modern digital algorithms. Where a credit institution lies at the core of such an ecosystem, the personal database becomes inseparable from the bank's operations, blending financial and non-financial data flows and thereby amplifying both market power and systemic risk. The next step in the development of legal relations will be

either to mandate the structural separation of credit institutions from the digital ecosystems built around them, or to recalibrate the sanction mechanisms in the field of information protection, competition and personal data. Indeed, if a systemically important bank were subject to turnover-based penalties arising from violations committed within its digital ecosystem, this could cause significant damage to the domestic financial system.

2) Consumer protection:

• The growing influence of large transnational digital platforms and global digital ecosystems—predominantly foreign—has been accompanied by numerous abuses in the field of consumer protection, given that consumers constitute the weaker party to the contract. In this regard, we should mention unfair terms of the user agreement and abuse of law on the part of large foreign digital platforms and digital ecosystems (for example, a jurisdiction clause transferring all disputes to a foreign forum). A ban on the transfer of disputes with consumers to foreign jurisdictions will contribute not only to the effective protection of domestic consumers, but also to the fair position of digital platforms and digital ecosystems in the Russian market, regardless of the origin of digital platforms and digital ecosystems.

• The presence in the legislation of the obligation for foreign large digital platforms and digital ecosystems to comply with Federal Law of July 1, 2021 No. 236-FZ "On the Activities of Foreign Persons in the Information and Telecommunications Network 'Internet' on the Territory of the Russian Federation" meets the goal of protecting information and personal data. The statutory obligation imposed on large foreign digital platforms and digital ecosystems to comply with Federal Law of July 1, 2021 No. 236-FZ serves the purpose of protecting information and personal data. However, the lack of clear definition of ecosystem does not allow identifying a Russian legal entity to be identified, created in accordance with the law, as part of the ecosystem, and, accordingly, as a proper respondent in consumer protection cases.

3) Protection of information and personal data:

• A certain digital platform acting as a business element within a digital ecosystem, collects data not for a specific task, as provided for by Federal Law of July 27, 2006 No. 152-FZ "On Personal Data Protection," but for **combining and analyzing them (including user behavior, etc.), and for the development of targeted advertising (simplifying consumer choice)**. However, the user, as a weak party to the agreement, should be able to choose for him/herself either the simplification of user behavior (i.e., consent to the transfer and processing of personal data within the entire ecosystem) or just limiting the processing of the personal data to using a specific platform and the product (service) offered by it.

• The collection and circulation of data within the digital ecosystem is currently allowed for the purpose of generating *information for the promotion of goods on the market (contextual and targeted advertising)* and is an exception (subclause "d" of Clause 1) from Federal Law of July 31, 2025 No. 351-FZ "On Amendments to the

Federal Law on Fundamentals of State Regulation of Trade Activities in the Russian Federation" (the law regulating the activities of companies that research consumer behavior and the market). However, as far as foreign digital platforms are concerned, this does not contribute to the protection of the domestic market or the personal data of Russian Federation citizens—the objective of Law No. 351-FZ. This is crucial for achieving market balance and digital sovereignty and protecting users from potential abuse by large multinational digital giants—foreign large digital platforms and foreign digital ecosystems.

• The collection and circulation of business users' data for the purpose of achieving market dominance and promoting the platform's or ecosystem's own products should be restricted under Federal Law "On the Fundamentals of State Regulation of Trade Activities in the Russian Federation"?

4) Taxation, tax agency and tax monitoring:

• Particular attention should be paid to the proper regulation of relations among the various businesses within an ecosystem that promote goods, works, and services of digital ecosystems. This is especially important as a common set of personal data and information about consumer behavior is used or may be used to generate advertising. Thus, when paid services are provided to advertise the products or services of companies within the digital ecosystem, there arise some tax risks. In this case, there is a risk of claims from the tax authority if preferential tax regimes are applied by individual participants within a digital ecosystem (there is a risk of additional taxes and penalties), as well as there may be additional VAT and income tax charges if the tax authority challenges the related-party transaction itself or the transaction value.

• Digital ecosystems need to train platform employees in tax agency management, as well as in tax monitoring of business partners and exchange of information on transactions with the Federal Tax Service of Russia.

5) Intellectual property and advertising:

• Elements of the ecosystem can use different means of identification that do not share common features.

• Registration of a junior trademark should not be refused solely on the ground that it contains an indication of the senior trademark of the entire ecosystem.

• Promotion of goods, works and services on various ecosystem platforms must be accompanied by a form of consent to the use of means of identification and other copyright-protected objects.

• Creation of preferential opportunities to promote the services of individuals as elements of digital ecosystems through in-app advertising (algorithms to attract the attention of users of a digital platform within the same digital ecosystem, the so-called "koldunshiki," or featured snippets). On the one hand, the placement of widgets generated by the analysis of particular user behavior can usually be interpreted as violation of antimonopoly legislation. However, the *Koldunshiki case* (*Federal*

*Antimonopoly Service v. Yandex*) corresponds to only those cases when an element of the digital ecosystem has the characteristics of an undertaking holding a dominant market position. In all other cases, it should be assumed that the analysis of personal data and user behavior to simplify consumer choice and to promote services within the ecosystem is one of the features of the ecosystem functioning itself as a business phenomenon, provided the principle of fair customization has been adhered to. Otherwise, digital ecosystems would be placed at a competitive disadvantage vis-à-vis other dominant market participants, such as large integrated digital platforms, which are able to promote goods and services within their own platform environments.

## Conclusion

This study addresses a key legal problem related to the substantial lag between the doctrinal and regulatory understanding of digital phenomena and the pace of their technological development. Employing an interdisciplinary approach grounded in the analysis of economic concepts followed by their legal assessment, the study seeks to reduce terminological uncertainty and to establish a scientifically grounded basis for an appropriate regulatory response to the phenomenon of digital ecosystems.

Digital ecosystems operate as autonomous economic institutions whose role in the contemporary competitive environment is characterized by a high degree of market concentration and a strategy of long-term capital investment. The infrastructural nature of these structures requires considerable upfront investment in the creation and maintenance of global data centers, network infrastructure and logistics systems. These operations are accompanied by significant technical and institutional risks caused by uncertainty as to future regulatory requirements. Consequently, broad regulatory intervention based on imprecise definitions may generate negative spillover effects and externalities, as well as unpredictable secondary consequences. The lack of a unified understanding of the nature of digital ecosystems hinders their sustainable development while an external constraint is the absence of consensus on optimal regulatory mechanisms that take into account their unique economic character, distinct from that of traditional market players.

The institutional efficiency of digital ecosystems is manifested in the generation of substantial positive externalities, expressed in a radical reduction of transaction costs and in the reduction of search costs for goods and services. There is a fundamental reduction in information-related transaction costs associated with searching for, obtaining and processing data to conclude transactions. The aggregation of supply and the minimization of costs of access to information significantly broaden consumer opportunities, which from the standpoint of economic theory is equivalent to an increase in an economic agent's real income. This enables consumers to optimize choice and effectively substitute digital ecosystems for less efficient traditional economic channels.

In addition, digital ecosystems provide a radical reduction in transaction costs relating to property rights. Acting as a new type of institutional intermediary, ecosystems assume key functions in contract formation and in securing the performance of obligations that, in classical models of market relations, would be borne directly by the parties to the legal relationship. By virtue of scale effects, data aggregation and the use of algorithms, digital ecosystems minimize costs associated with counterparty verification, ensuring the quality of goods and services, and dispute resolution, thereby increasing the transparency and efficiency of market relations.

To resolve the identified legal uncertainty and to form an adequate regulatory regime, the study proposes some key recommendations for the development of a new conceptual framework. This framework defines a complex digital platform and a digital ecosystem, as well as the concept of a meta-ecosystem. From a legal perspective, the fundamental distinction between a complex digital platform and a digital ecosystem depends on the degree of organizational and legal integration and on the legal status of the entities involved. While a complex digital platform represents a technological and functional aggregation of services, typically managed by a single legal entity, a digital ecosystem, according to our definition, necessarily involves multiple legally or organizationally distinct entities. These entities, whether groups of companies or contractual partnerships, operate on the basis of a consolidated database and shared technological solutions, which constitutes a qualitatively different legal phenomenon.

Five key features of a digital ecosystem have been identified: the use of technologies and algorithms, the existence of two or more product groups (services), a multiplicity of legal entities, a common consolidated user database, and the generation of additional consumer value derived from being within the ecosystem. The totality of these features crystallizes into three key values: technologies that ensure seamless interaction; data that form the basis for analysing user behaviour; and the resulting simplification of user interaction and consumer choice.

The outlined definitions and conceptual differentiations have made it possible to identify regulatory potential and possible directions for future legal regulation of digital ecosystems, relevant to various jurisdictions, including the Russian Federation. These potential areas include: the adaptation of competition law to maintain market balance under conditions of specific competition within and between ecosystems; the revision of consumer protection rules, taking into account complex transactional models; the development of enhanced mechanisms for ensuring the protection of information and personal data during their consolidation and cross-border transfer among multiple ecosystem entities; the formation of flexible tax regimes that adequately account for the unique structure of ecosystem revenue and expenditure; and the adaptation of intellectual property rules and advertising regulation to the dynamic environment of algorithmic content distribution and personalized advertising.

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