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MANAGERIAL APPROACHES TO THE DEVELOPMENT OF VIRTUAL ENTREPRENEURSHIP INFRASTRUCTURE UNDER CONDITIONS OF DIGITAL ECONOMIC TRANSFORMATION AND INSTABILITY

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INTRODUCTION. The digital transformation of the economy and the growing level of instability are gradually reshaping the conditions of entrepreneurial activity, fostering the emergence of virtual entrepreneurship as an independent form of economic activity that operates primarily in an online environment. Under these conditions, the infrastructure of virtual entrepreneurship becomes critically important, as it ensures the integration of digital platforms, services, institutional mechanisms, and managerial solutions aimed at strengthening business resilience and adaptability. Current academic research largely focuses on the technological aspects of digitalization, while managerial approaches to the development of such infrastructure remain insufficiently explored and systematized. This creates a clear need for deeper scholarly analysis. Expanding knowledge on governance mechanisms and on the formation of conditions that enable virtual entrepreneurship is essential in the context of digital transformation and economic instability.

THE HYPOTHESIS OF THE STUDY is that the development of virtual entrepreneurship under conditions of economic instability largely depends on the level of development of its infrastructure and the quality of managerial decision-making. It is assumed that the application of coordinated managerial

approaches to the development of digital platforms, services, and the institutional environment will enhance business viability and adaptability.

THE PURPOSE OF THE STUDY is to substantiate managerial approaches to the development of virtual entrepreneurship infrastructure under conditions of digital transformation and economic instability, with the aim of enhancing business resilience and adaptability.

CONCLUSIONS. The study finds that, under conditions of digital transformation and economic instability, virtual entrepreneurship operates on the basis of a support infrastructure that integrates digital platforms and services, the institutional environment, and managerial mechanisms. It is demonstrated that the development of this infrastructure is systemic in nature and depends on the coherence of stakeholders' actions and the rules governing interaction within the digital environment. The study further substantiates that the application of systemic, ecosystem-based, and adaptive approaches enhances the resilience and continuity of business processes in virtual entrepreneurship.

KEYWORDS: virtual entrepreneurship; digital transformation; entrepreneurial infrastructure; managerial approaches; entrepreneurial ecosystems; economic instability; business resilience.

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УПРАВЛІНСЬКІ ПІДХОДИ ДО РОЗВИТКУ ІНФРАСТРУКТУРИ ВІРТУАЛЬНОГО ПІДПРИЄМНИЦТВА В УМОВАХ ЦИФРОВОЇ ТРАНСФОРМАЦІЇ ЕКОНОМІКИ ТА НЕСТАБІЛЬНОСТІ

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ВСТУП. Цифрова трансформація економіки та зростання рівня нестабільності поступово змінюють умови підприємницької діяльності, сприяючи формуванню віртуального підприємництва як самостійної форми економічної активності, що функціонує переважно у онлайн середовищі. У цих умовах ключового значення набуває інфраструктура віртуального підприємництва, яка буде забезпечувати інтеграцію цифрових платформ, сервісів, інституційних механізмів та управлінських рішень, спрямованих на підвищення стійкості й адаптивності бізнесу. Поточні наукові дослідження переважно зосереджені на технологічних аспектах цифровізації, а управлінські підходи до розвитку потрібної інфраструктури залишаються недостатньо розкритими та систематизованими. Це потребує поглибленого наукового аналізу. Потрібно розширити знання про управління та формуванні умов функціонування віртуального підприємництва в контексті цифрової трансформації та економічної нестабільності.

ГІПОТЕЗА ДОСЛІДЖЕННЯ полягає в тому, що розвиток віртуального підприємництва в умовах нестабільної економіки значною мірою залежить від рівня розвитку його інфраструктури та якості управлінських рішень. Передбачається, що застосування узгоджених управлінських підходів до розвитку цифрових платформ, сервісів і інституційного середовища посприятиме підвищенню життєздатності та адаптивності бізнесу.

МЕТОЮ ДОСЛІДЖЕННЯ є обґрунтування управлінських підходів до розвитку інфраструктури віртуального підприємництва в умовах цифрової трансформації та економічної нестабільності з метою підвищення стійкості й адаптивності бізнесу.

МЕТОДИ ДОСЛІДЖЕННЯ. У дослідженні використано методи аналізу та синтезу, системний і структурний підходи, порівняльний аналіз, а також метод узагальнення наукових джерел.

РЕЗУЛЬТАТИ. У результаті дослідження встановлено, що віртуальне підприємництво в умовах цифрової трансформації та економічної нестабільності функціонує на основі інфраструктури підтримки, яка поєднує цифрові платформи й сервіси, інституційне середовище та управлінські механізми. Показано, що розвиток цієї інфраструктури має системний характер і залежить від узгодженості дій учасників та правил взаємодії в цифровому середовищі. Обґрунтовано, що застосування системного, екосистемного та адаптивного підходів підвищує стійкість і безперервність бізнес-процесів віртуального підприємництва.

КЛЮЧОВІ СЛОВА: віртуальне підприємництво; цифрова трансформація; інфраструктура підприємництва; управлінські підходи; цифрові платформи; підприємницькі екосистеми; економічна нестабільність; стійкість бізнесу.

Statement of the problem and its relation to important scientific and practical tasks. Contemporary processes of digital transformation of the economy lead to structural changes in the forms of organizing entrepreneurial activity, which brings to the fore the issue of forming and developing the infrastructure of virtual entrepreneurship. Under conditions of economic instability, the lack of systematic managerial approaches to the development of this infrastructure complicates the adaptation of entrepreneurial entities to changes in the external environment and reduces the effectiveness of leveraging digital opportunities. Existing academic research is predominantly focused on the technological aspects of business digitalization, while issues related to the managerial support of virtual entrepreneurship infrastructure development remain insufficiently explored. This limits the practical applicability of research findings in the formulation of managerial decisions at the levels of enterprises, digital platforms, and entrepreneurial ecosystems. In this context, the study of managerial approaches to the development of virtual entrepreneurship infrastructure is of significant scientific and practical importance, as it contributes to advancing management theory in the digital economy and to shaping effective mechanisms for managing entrepreneurial activity under conditions of instability.

The purpose of the study. The purpose of the study is to substantiate and systematize managerial approaches to the development of infrastructure support for virtual entrepreneurship under conditions of digital transformation and economic instability, and to determine their role in enhancing business resilience and adaptability.

Statement of the problem. Conditions of digital transformation and economic instability significantly reshape the nature of entrepreneurial activity, leading to the growing importance of virtual forms of entrepreneurship, digital platforms, and remote business models. Virtual entrepreneurship increasingly operates beyond traditional organizational and territorial boundaries, which heightens business dependence on digital and institutional infrastructure. In practice, the development of virtual entrepreneurship outpaces the scholarly understanding of the managerial mechanisms that support it. Existing studies predominantly focus on the effects of digital technologies, platforms, or individual digitalization tools, while the infrastructure supporting entrepreneurship is largely treated as a background or auxiliary factor rather than as an object of managerial decision-making. Under these circumstances, the absence of a holistic managerial approach to the development of virtual entrepreneurship infrastructure constrains the ability to ensure its sustainable operation, adaptation, and scaling in an unstable environment. This is particularly evident in economies experiencing structural shocks, including conditions of martial law and accelerated digitalization, where the fragmented

development of digital, institutional, and organizational components of infrastructure prevents the full realization of virtual entrepreneurship's potential.

Thus, the scientific problem lies in the lack of a systemic managerial vision for the formation and development of the support infrastructure for virtual entrepreneurship under conditions of digital transformation and economic instability, which necessitates further theoretical and applied research.

Analysis of recent publications. Contemporary research indicates that digital transformation is not merely a technological process but a systemic shift in the logic of how entrepreneurship, management, and economic ecosystems operate as a whole. Synthesizing reviews show that, within the digital economy, entrepreneurial activity is increasingly moving into the virtual environment, where digital platforms, data, and infrastructural solutions play a central role (Camps et al., 2025).

At the macro level, digital transformation is viewed as a driver of economic competitiveness and resilience. Assessments of Ukraine's economic digital transformation demonstrate that the development of digital infrastructure, e-government, and digital skills creates prerequisites for business modernization and integration into global markets, even under conditions of wartime instability (Shcherban et al., 2025). At the same time, the authors emphasize the persistence of the digital divide, institutional constraints, and insufficient coordination of managerial mechanisms for digital development.

At the firm and organizational levels, substantial attention is devoted to the relationship between digital transformation and organizational as well as innovation resilience. Empirical studies confirm that the adoption of digital technologies such as data analytics, automation, and platform-based solutions enhances firms' capacity to adapt to crisis conditions and sustain innovative activity (Peng & Jia, 2024; Zhang et al., 2025). However, these studies primarily focus on internal firm-level processes and largely overlook the role of external infrastructure and ecosystem interactions.

A distinct strand of research focuses on digital entrepreneurial ecosystems. Systematic reviews indicate that digital entrepreneurship emerges at the intersection of digital technologies and entrepreneurial ecosystems and depends on the interaction among users, platforms, institutions, and infrastructure (Bejjani, et al., 2023). At the same time, these studies highlight conceptual fragmentation and the lack of a unified vision regarding the structure and governance mechanisms of digital entrepreneurial ecosystems.

Analytical and applied studies, including reports based on the Digital Entrepreneurship Ecosystem Index, provide empirical evidence that the

presence of advanced digital infrastructure does not automatically lead to increased entrepreneurial activity (Acs, et al., 2025).

Research on the Ukrainian context, particularly in the retail sector and among small businesses, confirms the active adoption of CRM and ERP systems, cloud services, and electronic document management as responses to crisis conditions. However, these processes are largely adaptive in nature and are not accompanied by the formation of an integrated support infrastructure for virtual entrepreneurship (Sitnicki et al., 2024).

An analysis of contemporary publications allows us to conclude that existing research tends to focus either on the macroeconomic aspects of digital transformation, the internal managerial effects of enterprise digitalization, or the general characteristics of digital ecosystems. It is evident that managerial approaches to the development of support infrastructure for virtual entrepreneurship remain insufficiently systematized, particularly under conditions of economic instability.

This scientific gap necessitates further research aimed at shaping a managerial perspective on the development of virtual entrepreneurship infrastructure as a key component of the modern digital economy.

A comparative analysis of existing studies reveals the presence of shared conceptual approaches while simultaneously highlighting significant differences in the interpretation of the role of digital infrastructure and the management of entrepreneurial processes. Most authors agree that digital transformation creates new opportunities for entrepreneurship and enhances business adaptability to external shocks (Santos et al., 2023; Zhang et al., 2025). However, these effects are predominantly examined as by-products of technology adoption rather than as outcomes of deliberate infrastructure-oriented management.

In studies devoted to digital entrepreneurial ecosystems, infrastructure is interpreted as a set of platforms, institutions, and services that enable interaction among market participants (Lado et al., 2024; Acs et al., 2025). At the same time, managerial mechanisms for coordinating these elements, as well as for allocating roles and responsibilities among the state, business, and educational institutions, remain insufficiently formalized. This complicates the practical application of the ecosystem approach under conditions of instability.

Firm-level empirical studies show that digital transformation has a positive effect on innovation and organizational resilience only when appropriate managerial competencies are in place and business processes are properly designed (Peng & Jia, 2024; Sagala, 2025). However, these studies are largely confined to the micro level of analysis and do not account for the influence of external support infrastructure, which is critical for virtual entrepreneurship.

Ukrainian studies conducted under conditions of martial law emphasize the practical use of digital tools to sustain business activity and preserve

operational resilience (Sitnicki et al., 2024). At the same time, research on local digital transformation highlights substantial regional disparities in the level of digital maturity among the population of Ukraine (Bay & Yelisieiev, 2025).

Scientific publications highlight the importance of digital transformation, entrepreneurial ecosystems, and digital tools for business development under conditions of instability. At the same time, the issue of managing the development of support infrastructure for virtual entrepreneurship as an integrated system combining technological, institutional, and organizational components remains insufficiently explored. The identified research gap lies in the absence of a systemic managerial approach to the formation and development of such infrastructure under conditions of digital transformation and economic instability. This substantiates the relevance of further research aimed at developing managerial approaches to the advancement of virtual entrepreneurship infrastructure in Ukraine.

Statement of the main results and rationale.

1. Within the scope of the study, a comparative analysis of scholarly approaches to digital transformation and virtual entrepreneurship was conducted, focusing on how the infrastructural component is conceptualized. To this end, key analytical dimensions through which contemporary publications interpret entrepreneurship support infrastructure were identified, which made it possible to systematize existing approaches and reveal their limitations from a managerial perspective.

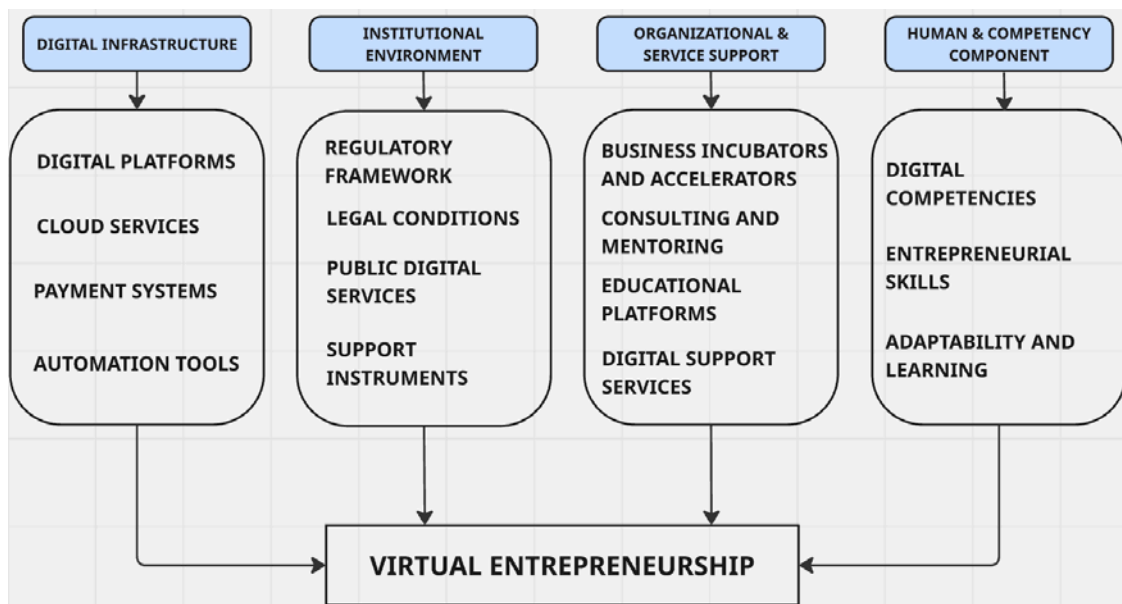
Table 1

Comparative analysis of scientific approaches to the support infrastructure for virtual entrepreneurship

Analytical approach	Interpretation of infrastructure	Main research focus	Key limitation of the approach
Technological	A set of digital platforms, ICT, data, and cloud services	Digitalization efficiency, automation, access to technologies	Ignores managerial and institutional coordination mechanisms
Institutional	Regulatory environment, policies, public digital services	Rules, standards, government support	Insufficiently accounts for the dynamics of digital platforms and business processes
Organizational	Internal processes, managerial competencies, digital skills	Firm resilience, adaptation, innovativeness	Limited to the micro level; does not account for external infrastructure
Ecosystem-based	A network of interactions among businesses, platforms, institutions, and users	Coordination of actors, network effects	Lacks a clear managerial logic for infrastructure development

Source: created by the author.

The comparative analysis indicates that each of the existing approaches captures only certain aspects of the phenomenon. At the same time, none of them provides a holistic managerial vision for the development of this infrastructure under conditions of digital transformation and economic instability.



Source: created by the author.

Figure 1. Structural components of the support infrastructure for virtual entrepreneurship

The framework integrates digital infrastructure, institutional environment, organizational and service support, and human and competency components, illustrating their combined role in enabling virtual entrepreneurial activity. The model reflects the analytical gap identified in recent studies, which predominantly examine technological or organizational aspects in isolation, while insufficiently addressing the infrastructure as a coherent and structured system.

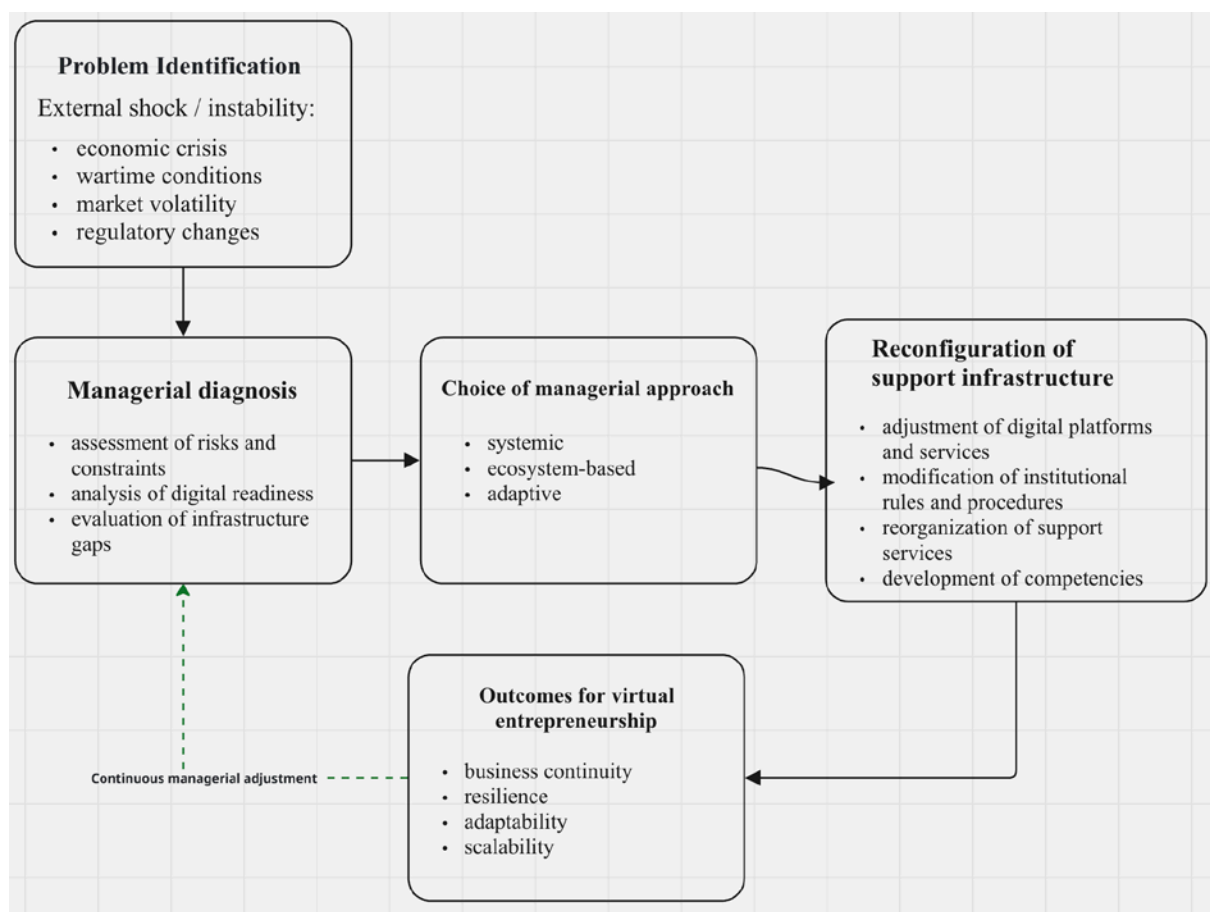
1.1. The support infrastructure for virtual entrepreneurship as a managerial system under conditions of instability. This system should be conceptually interpreted not as a set of individual tools or institutions, but as a dynamic, multi-level system that creates conditions for the emergence, functioning, scaling, and adaptation of entrepreneurial activity in the contemporary digital environment. In this interpretation, infrastructure acts as an integrated space of interaction among digital, institutional, organizational, and human components that enable entrepreneurs to operate beyond spatial constraints and under heightened uncertainty. Unlike the traditional view of infrastructure as a static base (physical assets, financial institutions, regulatory

frameworks), in virtual entrepreneurship infrastructure has a flexible, process-oriented nature and is formed through the interaction of ecosystem elements. Digital transformation shifts the focus from material infrastructure components to digital platforms, data, algorithms, and network-based coordination mechanisms that constitute the infrastructural core. In this context, platforms function both as channels of market access and as environments for integrating resources, knowledge, finance, and human interaction, thereby shaping a new logic of entrepreneurial activity. Economic instability, including crisis and wartime conditions, further transforms the role of infrastructure through which entrepreneurs operate in the digital environment (platforms, services, institutions, digital tools, and organizational mechanisms). As a result, infrastructure moves beyond its traditional role of enabling business growth and scaling and increasingly serves as a system for supporting resilience, adaptation, and the preservation of entrepreneurial activity. Under such conditions, its capacity for rapid reconfiguration, transaction cost reduction, decreased dependence on physical presence, and continuity of business processes becomes critical.

Conceptually, this infrastructure should be viewed as an adaptive managerial system that integrates digital platforms, institutional mechanisms, human capital, and ecosystem linkages, functioning through continuous coordination and balancing between development and resilience. This interpretation provides a theoretical foundation for the formulation of managerial approaches to its development in the digital economy and under conditions of an unstable external environment.

1.2. Structural components of the support infrastructure for virtual entrepreneurship. The support infrastructure of virtual entrepreneurship is formed by a set of interrelated structural components that enable the creation, functioning, and development of business in the digital environment. The key components include digital infrastructure, the institutional environment, organizational and service-based support mechanisms, and human resources. Digital infrastructure encompasses online platforms, cloud services, payment systems, automation tools, and communication technologies, which enable remote interaction and business scalability. The institutional component includes the legal and regulatory framework, regulatory mechanisms, and public or quasi-public support instruments that define the rules governing virtual entrepreneurship. The organizational and service component is represented by business incubators, accelerators, digital services, educational and consulting platforms that support entrepreneurs at different stages of their activities. The human component covers entrepreneurial, managerial, and digital competencies, as well as the capacity for learning and adaptation under changing conditions.

Effective interaction among these components is essential and systemic in nature: digital tools provide the technological foundation, the institutional environment establishes the framework conditions, organizational mechanisms translate support into practical solutions, and human capital ensures the effective use of available opportunities. It is the coordinated interaction of these components that forms an integrated support infrastructure for virtual entrepreneurship.



Source: compiled by the author.

Figure 2. The algorithm of managerial decision-making aimed at adapting virtual entrepreneurship to conditions of economic instability

The model demonstrates how external shocks trigger a managerial diagnosis, followed by the selection of appropriate managerial approaches and the reconfiguration of support infrastructure, ultimately ensuring business resilience, continuity, and scalability.

1.3. Managerial approaches to the coordinated development of the support infrastructure for virtual entrepreneurship. Ensuring the coordinated development of the support infrastructure for virtual entrepreneurship is based on the integration of several fundamental managerial approaches. The core

approach is the systemic one, under which infrastructure is viewed not as a collection of isolated elements but as a coherent system in which digital platforms, institutional rules, organizational services, and human resources interact and mutually reinforce each other.

The next is the ecosystem-based approach, which implies coordination among the state, business sector, educational and service organizations, and entrepreneurs themselves. In this case, management is oriented not toward direct administration but toward creating conditions for interaction within this network, including resource exchange and the scaling of digital solutions. Under conditions of economic instability, adaptive management becomes particularly important, as it focuses on the flexible adjustment of support instruments, the rapid deployment of digital services, and the reduction of business dependence on physical presence. This type of management enables infrastructure to respond swiftly to external shocks while maintaining continuity of entrepreneurial activity.

1.4. The role of digital platforms and ecosystem logic in transforming entrepreneurial support infrastructure. Digital platforms and ecosystem logic fundamentally transform traditional approaches to the infrastructural support of entrepreneurial activity by shifting the emphasis from ownership of resources to access to them. In the classical model, infrastructure was built around physical assets, local institutions, and stable organizational structures, which constrained entrepreneurial activity within spatial and institutional boundaries. In the digital environment, platforms assume a central role by performing infrastructural functions through the coordination of interactions among market participants. They bring together entrepreneurs, consumers, service providers, and financial instruments within a unified digital space, thereby lowering entry barriers and transaction costs. As a result, infrastructure ceases to function as an external foundation of business and becomes an embedded component of entrepreneurial activity.

Ecosystem logic transforms the very mechanism of infrastructure formation: instead of centralized creation and control, infrastructure emerges through the interaction of multiple actors, each contributing to the co-creation of shared value. Accordingly, the managerial focus shifts from direct control of individual elements to the design of rules, standards, and conditions for interaction within the digital ecosystem.

Consequently, traditional infrastructural approaches evolve into a flexible, modular model in which entrepreneurs are no longer tied to a specific location or institution but can combine digital services in line with the current needs of their business. Through these mechanisms, digital platforms and ecosystem logic give rise to a new type of infrastructural support.

Conclusions. Summarizing the above, it can be concluded that virtual entrepreneurship does not operate independently but is based on a supporting infrastructure that should be understood as a dynamic, multi-level, and adaptive managerial system rather than as a collection of isolated services or institutions. The conducted scholarly analysis of existing approaches demonstrates that technological, institutional, organizational, and ecosystem-based perspectives each capture only partial aspects of this infrastructure and fail to provide a comprehensive managerial logic for its development under conditions of transformation and instability. This clearly identifies a research gap and substantiates the need for an integrated combination of managerial approaches.

A key pattern of contemporary change has been identified: digital platforms and ecosystem logic shift the emphasis from ownership of resources to access to resources, while infrastructure becomes an embedded component of entrepreneurial activity. Accordingly, the managerial focus moves from “controlling individual elements” toward designing rules, standards, and conditions for interaction within the digital ecosystem. The support infrastructure for virtual entrepreneurship is thus conceptualized as a system formed through the interaction of four core components: digital infrastructure (platforms, cloud services, payment systems, automation tools), the institutional environment (rules, regulations, public and quasi-public instruments), organizational and service-based mechanisms (incubators, accelerators, consulting, education), and human capital (entrepreneurial, managerial, and digital competencies). The decisive factor is not the mere presence of these elements, but their coordinated interaction.

It is worth emphasizing the identified managerial approaches that ensure the coordinated development of such infrastructure:

- systemic, where infrastructure is viewed as an integrated whole of interrelated elements;
- ecosystem-based, focused on coordinating the actions of diverse actors and establishing shared rules of interaction;
- adaptive, aimed at the rapid reconfiguration of support instruments in response to contemporary challenges, with an emphasis on business process continuity.

The scientific novelty of the study lies in the following aspects: (a) a conceptual shift toward understanding infrastructure as an object of managerial decision-making and as a multi-level system; (b) the integration of fragmented approaches through a comparative framework (Table 1) and the identification of their managerial limitations; (c) an explanation of how digital platforms and ecosystem logic transform the infrastructure supporting entrepreneurial activity.

Prospects for further research. The proposed conclusions may be applied by enterprises, digital platforms, and public authorities to design support

infrastructure as a system that simultaneously ensures the resilience, adaptability, and scalability of virtual business under conditions of instability, through the coordination of people, the establishment of new standards of interaction, and the development of competencies. Future research should focus on refining managerial mechanisms for the development of virtual entrepreneurship support infrastructure as an integrated system, as existing studies often treat it as a background factor rather than as an object of managerial decision-making. In particular, empirical validation is needed to examine the proposed interaction among the digital, institutional, organizational and service-based, and human components, and to determine how their coherence shapes business resilience and adaptability. Further attention should also be given to the important research direction of platform governance as infrastructure, specifically how rules, standards, and interaction conditions within ecosystems replace traditional approaches, and which managerial instruments effectively ensure proper coordination.

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