

# ARTIFICIAL INTELLIGENCE AND INEQUALITY IN THE STARTUP ECONOMY: A CONCEPTUAL FRAMEWORK FOR DIGITAL STRATIFICATION

Vladimir Menshikov<sup>1</sup>, Oksana Ruza<sup>2</sup>, Jelena Semeneca<sup>3</sup>

**Abstract.** This article provides a conceptual analysis of the relationship between the rapid diffusion of artificial intelligence technologies and the emergence of new forms of digital inequality within the startup economy. Against the backdrop of digital transformation, characterised by the rise of platform capitalism, algorithmic governance and the phenomenon of 'artificial sociality', there is an increasing demand for updated theoretical frameworks that can explain structural changes in communication systems and access to economic resources. This study aims to develop such a framework for digital stratification in startup ecosystems, focusing on the interplay between venture capital, technological innovation, and social structures. In addition to conceptual modelling, the research employs a mixed-methods approach, combining quantitative statistical analysis with interpretative theoretical synthesis. The empirical basis draws on data from the Baltic countries (Latvia, Lithuania and Estonia) from 2019 to 2024, including indicators of venture capital investment, startup density and gender distribution among founders. Correlation and regression analyses are used to identify structural dependencies between investment intensity and ecosystem development, and comparative analyses are employed to evaluate cross-country disparities. This methodology combines Niklas Luhmann's systems theory, Pierre Bourdieu's theory of capital, and approaches to political economy, platform capitalism (Nick Srnicek) and surveillance capitalism (Shoshana Zuboff). This allows for a multi-layered interpretation of digital inequality that goes beyond purely economic indicators. The results reveal a pronounced concentration of innovation resources. Estonia leads in terms of both venture capital investment per capita (1,100 EUR compared to 153 EUR in Lithuania and 56 EUR in Latvia) and startup density per 100,000 people (82 versus 38 and 24, respectively). A strong relationship has been confirmed between venture capital intensity and startup density ( $r = 0.81$ ,  $\beta = 0.73$ ,  $p < 0.01$ ) through statistical analysis. However, gender asymmetry remains structurally embedded: startups with at least one female founder receive less than 5% of total venture funding, indicating persistent barriers to accessing innovation capital. The article introduces the concept of 'cognitive stratification' as a new form of inequality based on differential access to knowledge infrastructures, technological competencies and innovation networks. This concept builds on traditional approaches to social stratification by emphasising the cognitive and algorithmic dimensions of exclusion in digital economies. The study concludes that, while functioning as key drivers of economic growth and technological innovation, startup ecosystems simultaneously reproduce and reinforce structural inequalities. These findings have practical implications for innovation policy, indicating the necessity of targeted interventions to reduce investment concentration and enhance gender inclusivity within venture financing systems.

**Keywords:** artificial sociality, cognitive stratification, digital transformation, startup ecosystems, venture capital dynamics, innovation concentration, digital inequality, Baltic states, algorithmic communication, platform economy.

**JEL Classification:** B55, Q55

<sup>1</sup> Daugavpils University, Latvia

E-mail: [vladimir.mensikovs@du.lv](mailto:vladimir.mensikovs@du.lv)

ORCID: <https://orcid.org/0000-0001-9988-8588>

<sup>2</sup> Institute of Humanities and Social Sciences of Daugavpils University, Latvia (*corresponding author*)

Email: [oksana.ruza@du.lv](mailto:oksana.ruza@du.lv)

ORCID: <https://orcid.org/0000-0002-6194-3841>

<sup>3</sup> Daugavpils University, Latvia

Email: [jelena.semeneca@du.lv](mailto:jelena.semeneca@du.lv)

ORCID: <https://orcid.org/0000-0003-1733-2709>



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## 1. Introduction

Digital transformation has emerged as one of the most salient drivers of contemporary social and economic change. The accelerated evolution of artificial intelligence, digital platforms, and algorithmic decision-making systems has profoundly reconfigured the architecture of communication and the organisation of economic activity. In this context, scholars are increasingly examining the emergence of novel forms of social interaction mediated by digital infrastructures and algorithmic agents.

The concept of artificial sociality has emerged as an analytical framework for understanding these transformations. In contradistinction to conventional models of social interaction, the notion of artificial sociality signifies communication processes in which technological systems function as active intermediaries or integral components of communication networks. From a theoretical perspective, this phenomenon can be interpreted through the lens of systems theory developed by Niklas Luhmann (1995), which emphasises the central role of communication structures in the reproduction of social systems. Concurrently, contemporary analyses of digital capitalism underscore the growing power of digital platforms and data infrastructures in shaping economic and social relations.

Nick Srnicek's (2016) theory of platform capitalism is of particular relevance in this context. It describes how digital platforms operate as novel economic infrastructures that reorganise markets and redistribute value creation. In a similar vein, Shoshana Zuboff's (2019) concept of surveillance capitalism underscores the significance of data extraction and algorithmic governance within contemporary digital economies. These theoretical perspectives suggest that digital transformation is not only a technological process but also a profound reconfiguration of social power, communication systems and economic structures.

The Baltic states offer a particularly interesting context for examining these dynamics. Over the past decade, Latvia, Lithuania and Estonia have experienced rapid growth in their startup ecosystems, venture capital markets and digital innovation sectors. Concurrently, this growth has been accompanied by the increasing concentration of technological resources and investment within relatively small innovation clusters and networks. These developments give rise to significant questions regarding the social implications of digital transformation in small, innovation-driven economies.

Despite the expanding literature on platform capitalism and digital inequality, the relationship between artificial sociality, innovation concentration, and social stratification remains insufficiently explored within the context of regional startup ecosystems. In particular, there has been limited attention paid

to the manner in which algorithmic communication environments interact with venture capital structures, entrepreneurial networks, and forms of symbolic capital within innovation-driven economies.

The present article addresses this lacuna by examining the Baltic startup ecosystem as a case study of emerging digital stratification. The present study integrates theoretical insights from sociological systems theory and platform economy research with empirical observations of the Baltic innovation environment. The aim of this integration is to develop a conceptual framework for analysing the social implications of artificial sociality in contemporary digital economies. This study conceptualises artificial sociality as a hybrid communication environment in which algorithmic systems, digital platforms and human actors collaborate to produce and circulate social and economic interactions. Through the integration of sociological systems theory, the theory of capital and political economy approaches to platform and surveillance capitalism, artificial sociality is recognised as a feature that is structurally embedded within digital economies and that reshapes communication processes and access to resources.

The study is guided by the following research questions:

1. In what ways can the concept of artificial sociality be integrated into existing sociological and economic approaches to digital transformation?
2. What structural changes in the fields of communication and economic organisation accompany the expansion of digital platforms and algorithmic infrastructures?
3. What effect does the concentration of venture capital and technological resources have on the social stratification of Baltic startup ecosystems?
4. What forms of digital inequality arise in innovation-driven economies, against a backdrop of increasing algorithmic intermediation and platform governance?

## 2. Literature Review

The rapid development of artificial intelligence and digital platforms has significantly transformed the architecture of modern economic and social systems. Contemporary research increasingly emphasises that digital technologies enhance economic productivity and reshape social relations, communication patterns and institutional structures. In this context, the concept of artificial sociality has emerged as a valuable analytical tool for understanding the role of algorithmic infrastructures in mediating human interaction and economic activity.

One of the key theoretical approaches to analysing artificial sociality is Niklas Luhmann's (1995) sociological systems theory. According to this approach, social systems are constituted through

communication rather than through individual actors. These communication processes reproduce social structures by generating meaning continuously within specific systemic boundaries. In the context of digital transformation, algorithmic systems and artificial intelligence are playing an increasingly important role in communication processes, influencing the production, circulation and interpretation of information. Consequently, technological infrastructures become embedded within communication networks, contributing to the emergence of hybrid environments in which human and algorithmic agents collaborate to shape social interaction.

Research on the political economy of digital platforms has significantly contributed to the understanding of structural transformations within contemporary capitalism, in parallel with sociological systems theory. Nick Srnicek's (2016) theory of platform capitalism conceptualises digital platforms as new economic infrastructures that enable the extraction and control of data flows. These platforms act as intermediaries, connecting users, producers and markets, while also accumulating substantial amounts of behavioural and transactional data. Through network effects and data-driven optimisation, platform companies are consolidating economic power and reshaping market structures. This is particularly evident in technology-driven startup ecosystems, where digital platforms often act as infrastructural environments and mechanisms of value creation.

The concept of surveillance capitalism, developed by Shoshana Zuboff (2019), provides complementary insights. This framework emphasises the role of large-scale data extraction in contemporary digital economies. Zuboff (2019) argues that behavioural data generated through digital platforms constitutes a new form of economic resource that can be used to predict and influence human behaviour. As algorithmic systems increasingly influence decision-making processes in economic and social spheres, the accumulation and control of data are becoming key sources of power. Consequently, digital infrastructures contribute to both economic innovation and new forms of asymmetry and inequality within digital societies. Recent scholarship has also examined how digital innovation ecosystems influence the distribution of technological resources and entrepreneurial opportunities. Startup ecosystems, venture capital networks and innovation clusters play a crucial role in shaping regional technological development. Research shows that successful innovation ecosystems tend to concentrate capital, talent, and knowledge within relatively small geographical areas. This phenomenon has been observed in major global innovation hubs such as Silicon Valley, London and Berlin, where venture capital investments and startup activity are highly concentrated.

The Baltic states have attracted growing scholarly interest as emerging innovation-driven economies. Over the past decade, Estonia, Lithuania and Latvia have experienced significant growth in their startup ecosystems and digital sectors. Estonia is often held up as an example of good digital governance thanks to its advanced e-government infrastructure and digital identity systems. Meanwhile, Lithuania has emerged as a regional fintech hub, thanks to its regulatory innovation and proactive financial supervision policies. While Latvia has demonstrated steady growth in its startup sector, it has experienced comparatively slower integration into global venture capital networks. Despite these positive developments, recent studies suggest that startup ecosystem growth may generate new forms of socio-economic stratification. Venture capital markets often favour founders who possess high levels of social, cultural and educational capital, which can reinforce existing inequalities within entrepreneurial communities. Furthermore, innovation ecosystems tend to concentrate opportunities in capital cities and within established technological networks, limiting access for peripheral regions and underrepresented social groups.

Gender inequality is another important aspect of the stratification of startup ecosystems. Empirical research indicates that women are significantly underrepresented among startup founders and recipients of venture capital funding worldwide. Several studies have shown that only a small proportion of venture capital funding is allocated to startups founded or co-founded by women. These disparities are perpetuated by structural factors such as investor bias, limited access to professional networks, and persistent stereotypes about technological entrepreneurship.

Similar patterns have been observed in the Baltic region. Although national governments and innovation agencies have introduced programmes to support women entrepreneurs, the proportion of startups founded by women remains relatively low compared to those founded by the male-dominated teams. At the same time, various institutional initiatives have emerged to address this imbalance, including programmes that promote women's participation in technology, entrepreneurship and innovation ecosystems.

In this broader context, the concept of artificial sociality provides a valuable analytical framework through which to integrate the technological, economic and sociological aspects of digital transformation. Examining the intersection of algorithmic communication infrastructures with venture capital dynamics and innovation ecosystems makes it possible to analyse the emergence of new forms of digital stratification (Menshikov & Ruza, 2024; Menshikov, Ruza, Semeneca, 2024; Menshikov et al., 2024;

Menshikov, Ruza, Simakhova, 2025; Menshikov et al., 2025).

However, the relationship between artificial sociality and the structural dynamics of startup ecosystems is a topic that has not been sufficiently explored in existing literature. Most studies focus on either the technological aspects of artificial intelligence or the economic aspects of venture capital markets. There have been few attempts to integrate these perspectives within a unified sociological framework. The expansion of digital platforms and algorithmic infrastructures is producing significant structural transformations in communication and economic organisation. As communication becomes increasingly mediated by algorithmic systems and economic activity is reorganised around platform-based models characterised by network effects, data extraction and scalable digital infrastructures, the importance of data as a central form of economic power is growing. These processes reinforce the growing significance of data as a key form of economic power.

This article aims to bridge this gap by analysing how algorithmic infrastructures, digital platforms and venture capital networks collectively influence patterns of innovation concentration and social stratification within Baltic startup ecosystems.

## 2. Materials and Methods

This research project takes a mixed analytical approach, combining theoretical synthesis with an empirical analysis of innovation ecosystems in the Baltic states. The methodological framework incorporates sociological theory, comparative institutional analysis and a quantitative examination of startup ecosystem indicators.

Firstly, the study employs a theoretical framework derived from sociological systems theory and the political economy of digital platforms. The concepts of Niklas Luhmann (1995), Nick Srnicek (2016) and Shoshana Zuboff (2019) are employed to interpret the structural changes to communication and economic systems brought about by digital transformation and algorithmic mediation. These theoretical perspectives provide a conceptual basis for analysing artificial sociality and its relationship with digital innovation ecosystems.

Secondly, the empirical component of the research involves a comparative analysis of startup ecosystems in Estonia, Lithuania and Latvia between 2019 and 2025. The Baltic region is a useful case study because it has a relatively small population, high levels of digital transformation, and active participation in global technological markets. This comparative approach enables the identification of both common regional patterns and country-specific institutional differences.

Thirdly, quantitative indicators are employed to evaluate the dynamics of innovation concentration and venture capital investment. The analysis includes several key variables:

- Venture capital investment per capita;
- number of active startups;
- number of unicorn companies;
- gender distribution among startup founders;
- geographical concentration of startups within capital cities.

These indicators enable the evaluation of the distribution of technological resources and investment flows within Baltic startup ecosystems over time.

Fourthly, the study incorporates a qualitative case analysis of a selection of high-growth technology companies from the Baltic region. These cases demonstrate the interaction between individual entrepreneurial trajectories and broader institutional and financial environments. Particular attention is given to the impact of social capital, professional networks and prior entrepreneurial experience on startup success.

Finally, the research uses an interpretative sociological approach to combine empirical observations with the theoretical concept of artificial sociality. This approach facilitates an examination of not only the economic performance of startup ecosystems, but also the broader social implications of digital innovation and algorithmic infrastructures.

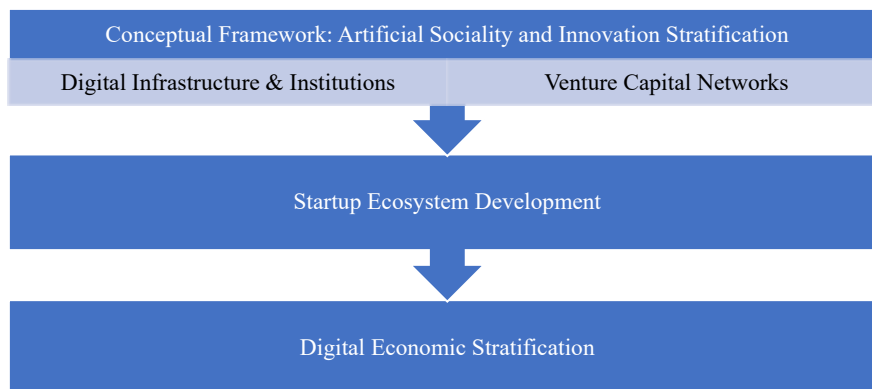
## 3. Results and Discussion

### Innovation concentration in startup ecosystems.

The empirical analysis reveals a significant concentration of innovation resources within a small number of global and regional startup ecosystems. This pattern is consistent with previous research emphasising the spatial clustering of high-growth entrepreneurial activity and venture capital investment (Stam, 2015; Stam et al., 2021; Brown & Mason, 2017; Nambisan et al., 2019; Cochen, 2006; Kenney, 2016; Piketty, 2014).

According to data from Eurostat and the European Innovation Scoreboard, innovation capacity remains unevenly distributed across European countries. Northern and Western European economies demonstrate greater research intensity, venture capital investment and technological entrepreneurship than peripheral regions (European Commission, 2023; Eurostat, 2023).

Within the Baltic region, Estonia has emerged as a particularly dynamic startup ecosystem, largely due to its advanced digital infrastructure, supportive regulatory environment, and strong integration into global technology networks. The success of Estonian technology firms has contributed to the formation of one of the highest startup densities in Europe relative to population size (Startup Genome, 2023).



**Figure 1. Conceptual Framework: Artificial Sociality and Innovation Stratification**

Source: elaborated by the authors

Table 1

**Venture Capital Investment in the Baltic Startup Ecosystem (2019–2024)**

Year	Estonia (€M)	Lithuania (€M)	Latvia (€M)	Baltics total (€M)
2019	220	120	40	380
2020	320	150	45	515
2021	1500	430	90	2020
2022	1200	300	80	1580
2023	650	200	110	960
2024	450	180	90	720

Source: elaborated by the authors based on data from Dealroom (2024), Practica Capital (2024), Baltic VC (2023), and KPMG (2024).

Empirical data indicates that venture capital investment in Baltic startups experienced rapid growth between 2019 and 2022, followed by a correction in 2023–2024 that mirrored global venture capital market trends. Estonia has consistently attracted the largest share of venture investment, reflecting its highly developed digital ecosystem and the global integration of technology firms.

The sharp increase in funding between 2021 and 2022 corresponds with the global expansion of venture capital markets and the rapid growth of technology sectors, including fintech, mobility platforms and artificial intelligence. During this period, more than 4 billion EUR in venture capital was raised across the Baltic region, exceeding the cumulative funding volumes of earlier years.

Although investment volumes declined following the correction in the global technology market, the

long-term trend indicates sustained growth in early-stage venture funding and an increasing presence of international investors in Baltic startup ecosystems.

In terms of both capital intensity and number of investment rounds, Estonia clearly dominates the regional venture ecosystem, while Lithuania demonstrates strong growth in SaaS and fintech startups. Latvia is becoming increasingly active, but still lags behind the other two Baltic countries when it comes to attracting venture funding.

The Baltic startup ecosystem accounts for only a small proportion of total European venture capital investment. However, when adjusted for population size, it ranks among the most venture-capital-intensive regions in Europe.

Figure 2 shows the development of venture capital (VC) investment in Baltic startup ecosystems from 2019 to 2024. The X-axis shows the years, and the Y-axis

Table 2

**Baltic Startup Ecosystem Indicators (2024)**

Indicator	Estonia	Lithuania	Latvia
Startup funding per capita (EUR)	~1100	~153	~56
Total startup enterprise value (billion EUR)	26.8	13.2	3.2
Number of investment rounds (2023–2024)	Highest in region	Medium	Lower
Dominant sectors	Mobility, fintech, AI	SaaS, fintech	Deep tech, fintech

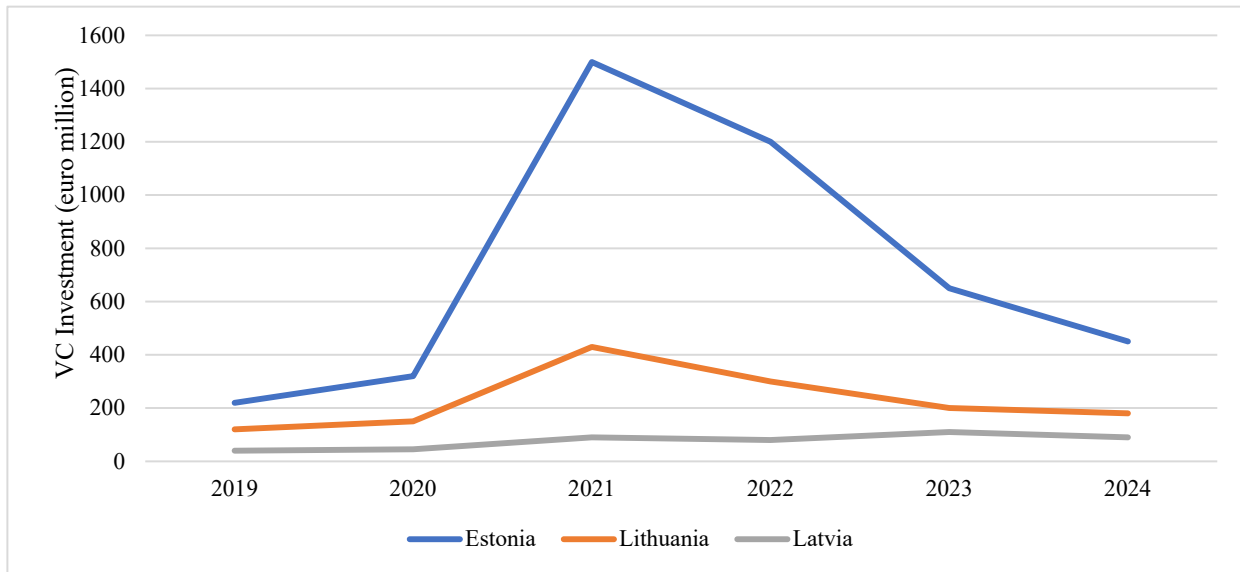
Source: elaborated by the authors based on data from Dealroom (2024), Practica Capital (2024), Baltic VC (2023), and KPMG (2024).

Table 3

**Venture Capital (VC) Dynamics in Europe (Comparative Context)**

Year	Europe VC investment (€B)	Baltic share (%)
2019	36	1.0
2020	42	1.2
2021	95	2.1
2022	85	1.9
2023	62	1.5
2024	62	1.2

Source: elaborated by the authors based on data from Dealroom (2024), Practica Capital (2024), Baltic VC (2023), and KPMG (2024).



**Figure 2. Venture Capital Growth in Baltic Startup Ecosystems (2019–2024)**

Source: elaborated by the authors based on data from Dealroom (2024), Practica Capital (2024), Baltic VC (2023), and KPMG (2024).

shows VC investment volumes in millions of euros. There are three trendlines, each representing a different country: Estonia, Lithuania and Latvia.

The figure reveals several notable patterns. There was a period of strong exponential growth in VC investment between 2020 and 2022, with the highest levels of investment observed in 2021. This indicates a peak in market activity. Following this, the figure shows a correction phase in 2023–2024, which is consistent with the global slowdown in venture capital markets. Throughout this period, Estonia consistently leads the way in terms of venture investment intensity, surpassing both Lithuania and Latvia.

Overall, Figure 2 shows the cyclical nature of venture capital flows and how a small number of leading startup ecosystems dominate the Baltic region.

**Venture capital and startup dynamics.** The data also reveal significant disparities in access to venture capital financing, one of the most critical factors influencing startup growth and scalability. Venture capital is essential for enabling technological experimentation

and the rapid growth of innovative firms (Kerr et al., 2014; Gompers et al., 2020).

However, venture capital funding remains highly selective in its distribution. Empirical studies show that venture capital investors tend to focus their investments on specific networks and geographical areas, which strengthens the competitive advantage of well-established ecosystems (Azoulay et al., 2020; Mason & Brown, 2014).

Recent industry analyses confirm that, although investment volumes fluctuate depending on macroeconomic conditions and global financial cycles, European venture capital markets have expanded significantly since 2019. According to data from Crunchbase and PitchBook, venture investment in European startups reached record levels in 2021–2022, before slowing during the global technology market correction of 2023 (Crunchbase, 2024).

Despite these fluctuations, the long-term trend shows that venture capital funding for technology startups is steadily increasing, particularly in sectors related to artificial intelligence, fintech and digital platforms.

**Conceptual Overview: Innovation Concentration and Emerging Inequalities.** The concentration of innovation resources within startup ecosystems can have significant implications for patterns of economic inequality. Although startup-driven innovation can contribute to economic growth and technological advancement, it may also reinforce existing structural disparities.

Recent research on digital economies suggests that innovation-driven growth often exhibits strong "winner takes all" dynamics, whereby a small number of highly successful firms capture a disproportionate amount of market value and investment (Teece, 2018; Van Dijck et al., 2018; Rochet, 2003).

Furthermore, the spatial clustering of innovative firms can contribute to regional inequalities, as high-growth technology companies tend to be concentrated in urban innovation hubs that have strong knowledge infrastructures and venture capital networks (Florida, 2017).

In the Baltic context, these dynamics are reflected by the concentration of startup activity in major urban centres such as Tallinn, Riga and Vilnius. These cities act as focal points for entrepreneurial networks, venture funding and technological talent.

These conceptual insights lay the groundwork for examining how venture capital allocation, startup density and other structural factors influence the practical outcomes of innovation ecosystems in the Baltic region. This topic will be explored in the following empirical analysis.

**Innovation ecosystems and emerging inequality.** In order to empirically investigate the structural patterns of innovation and their relationship with economic inequality, a comprehensive analysis was conducted of venture capital allocation, startup density and related ecosystem indicators within Baltic startup environments. This approach facilitates the quantification of the effects of spatial and financial concentration and their implications for regional innovation disparities.

Based on the conceptual patterns of innovation concentration outlined above, the authors examined

empirical indicators across Baltic startup ecosystems, including venture capital allocation, startup density and the structural characteristics of urban innovation hubs. In line with the theoretical framework, the data revealed that startup activity was disproportionately concentrated in the major urban centres of Tallinn, Riga and Vilnius, which functioned as primary nodes for entrepreneurial networks, capital flows and technological talent. This spatial clustering emphasises the uneven distribution of innovation capacity across the region, highlighting the tangible impact of winner-takes-all dynamics on national startup ecosystems.

A correlation and regression analysis was conducted to further examine the relationship between venture capital investment and the structural development of startup ecosystems. The results are presented in Table 4. The analysis revealed a strong positive correlation between venture capital investment intensity and startup ecosystem density. The Pearson correlation coefficient ( $r = 0.81$ ) indicates a statistically significant positive association between venture capital investment per capita and the number of startups relative to population size. The regression results confirm that venture capital investment is one of the most important predictors of expansion in startup ecosystems. The regression coefficient ( $\beta = 0.73$ ,  $p < 0.01$ ) indicates a strong association between increased venture capital availability and higher startup density.

Although their explanatory power is lower than that of venture capital investment, control variables such as GDP per capita and digital infrastructure also demonstrate significant relationships with startup ecosystem development. These findings reinforce the idea that access to venture financing is pivotal in determining the spatial concentration of innovation ecosystems.

Overall, the statistical analysis provides empirical support for the hypothesis that venture capital intensity contributes to the emergence of concentrated innovation hubs, thereby reinforcing the uneven distribution of technological entrepreneurship across regions (Shane, 2003; Simakhova et al., 2024).

Table 4

**Correlation and Regression Analysis: Venture Capital (VC) Investment and Startup Density in Baltic Ecosystems**

Variable	Pearson Correlation (r)	Spearman (ρ)	Regression Coefficient (β)	p-value
VC investment per capita	0.81	0.78	0.73	<0.01
Startup density (startups per 100k population)	0.81	0.78	–	–
GDP per capita (control variable)	0.64	0.61	0.29	<0.05
Digital infrastructure index	0.69	0.66	0.34	<0.05

**Dependent variable:** Startup density

**Independent variable:** VC investment per capita

Sources: Eurostat (2023); Dealroom Baltic Startup Landscape (2024); Startup Genome Global Startup Ecosystem Report (2023); European Innovation Scoreboard (2023).

The findings demonstrate that the concentration of venture capital plays a decisive role in shaping patterns of social stratification within Baltic startup ecosystems. The strong statistical relationship between venture capital intensity and startup density confirms that access to financial resources functions as a key mechanism driving the spatial concentration of innovation and reinforcing cumulative advantages for actors embedded in well-developed entrepreneurial networks.

The structural concentration of innovation resources within Baltic startup ecosystems becomes even more evident when analysed using a composite innovation concentration index. Table 5 provides a comparative assessment of Baltic startup ecosystems in relation to the European Union average.

The results reveal significant asymmetry within the Baltic region. Estonia has the highest level of innovation concentration, with an index value of 1.85 – well above the EU average. This reflects the country's high density of startups, significant venture capital investment, and the presence of several globally recognised technology firms.

Lithuania demonstrates a moderate level of innovation concentration, with an index close to the European average of 1.02. This reflects the rapid growth of fintech and SaaS startups in Lithuania, particularly in the capital city of Vilnius.

Conversely, Latvia exhibits a lower innovation concentration index (0.71), indicating relatively weaker integration into global venture capital flows and a smaller startup ecosystem value.

These findings confirm that the Baltic innovation landscape is characterised by both regional disparities

between Western and Eastern Europe and internal asymmetries within the Baltic region itself. Estonia's strong dominance illustrates how institutional factors such as digital governance, regulatory frameworks and entrepreneurial networks can accelerate the formation of globally competitive startup ecosystems (Kuratko, 2021).

At the same time, the uneven distribution of innovation resources is contributing to the emergence of patterns of digital economic stratification. These patterns are characterised by the concentration of technological entrepreneurship and venture capital within a limited number of urban and institutional environments.

Another important aspect of inequality in innovation ecosystems is the representation of women in startup entrepreneurship and venture capital allocation. Recent research shows that women are significantly underrepresented among startup founders and venture-backed entrepreneurs in most global innovation ecosystems.

As shown in Table 6, the Baltic startup ecosystem broadly reflects this structural pattern. While the proportion of startups with at least one female founder ranges between 21% and 26% in the Baltic countries, the amount of venture capital funding allocated to female-led startups remains considerably lower.

Notably, startups with at least one female founder receive less than 5% of total venture capital investment, reflecting broader European patterns of gender imbalance in venture capital markets. Several recent studies have documented similar trends when examining the role of gender bias in venture capital decision-making and entrepreneurial financing.

Table 5

**Innovation Concentration Index in Baltic Startup Ecosystems (Comparative EU Context)**

Indicator (2024)	Estonia	Lithuania	Latvia	EU average
Startups per 100k population	82	38	24	32
Venture Capital investment per capita (EUR)	1100	153	56	140
Startup ecosystem value per capita (EUR)	20,100	4,700	1,700	5,200
Unicorns per 1 million population	4.5	0.7	0.0	0.8
Innovation concentration index*	1.85	1.02	0.71	1.00

*Innovation Concentration Index calculated as a composite indicator based on normalised values of startup density, venture capital per capita, and ecosystem value relative to the EU average.*

**Sources:** Eurostat (2023); Dealroom European Startup Landscape (2024); Startup Genome Global Startup Ecosystem Report (2023); European Innovation Scoreboard (2023).

Table 6

**Gender Dynamics in Baltic Startup Ecosystems (2019–2024)**

Indicator	Estonia	Lithuania	Latvia	EU average
Share of startups with at least one female founder (%)	21	24	26	23
Share of all-female founding teams (%)	5	6	7	6
Share of venture capital funding to female-led startups (%)	3.2	4.1	4.8	5.0
Share of women in startup workforce (%)	32	34	35	33
Female representation in startup leadership (%)	18	20	21	22

*Sources: elaborated by the authors based on data from European Commission, (2024); European Institute for Gender Equality, (2024); Dealroom.com, (2024); Startup Genome, (2023).*

Notwithstanding these disparities, the Baltic region exhibits comparatively elevated female participation in the startup workforce, as compared with the European average. Women represent approximately one-third of employees in technology startups, suggesting that gender inequalities are more pronounced at the level of founder status and capital access rather than general employment in innovation sectors.

These findings reinforce the broader argument that startup ecosystems can generate technological innovation while also reproducing existing social inequalities. Inequalities in access to entrepreneurial capital, leadership opportunities and venture financing contribute to the emergence of new forms of digital economic stratification within innovation-driven economies.

#### 4. Discussion

**Startup ecosystems as social fields.** The empirical findings can be interpreted using the theoretical framework developed by Pierre Bourdieu (1986). From this perspective, startup ecosystems are specific social fields in which participants compete for different types of capital. In entrepreneurial ecosystems, economic capital is represented by venture funding; cultural capital by technological expertise and education; and social capital by access to professional networks and investor communities. Entrepreneurs who possess a strong combination of these forms of capital are more likely to secure venture funding and successfully grow their businesses.

**Systemic selectivity of innovation.** The observed concentration of venture capital and entrepreneurial activity can also be understood in terms of the systems theory developed by Niklas Luhmann (1995). Innovation ecosystems operate as specialised subsystems within the wider economic system. They operate according to specific communication codes relating to technological novelty and economic scalability. Startup accelerators, venture capital investors and innovation agencies act as filters, determining which entrepreneurial projects gain access to financial resources and institutional support. This systemic selectivity leads to the concentration of innovation resources within a relatively small number of firms and ecosystems.

**Platform capitalism and digital concentration.** Another key aspect of the dynamics of the startup ecosystem is the increasing prevalence of digital platform business models. Many contemporary startups aim to create scalable digital platforms that can coordinate large networks of users and data flows. This development is consistent with the theory of platform capitalism proposed by Nick Srnicek (2016). Powerful network effects allow successful platform

companies to expand rapidly and dominate global markets (Vallas, 2020).

**Data and digital power.** The growing importance of data in the digital economy is another factor contributing to innovation concentration. Startups operating in sectors such as artificial intelligence and fintech, for example, rely heavily on large datasets and advanced analytical technologies. This corresponds to the concept of surveillance capitalism, as defined by Shoshana Zuboff (2019).

From this perspective, data has become a new form of economic capital that digital firms can accumulate and monetise.

**Cognitive stratification in the digital economy.** Taken together, the findings of this study suggest the emergence of a new form of social inequality associated with the knowledge economy. Unlike traditional forms of stratification, which are primarily based on income or property ownership, contemporary digital economies increasingly reflect inequalities in access to knowledge, technological competencies and innovation networks. This phenomenon can be conceptualised as "cognitive stratification", whereby individuals and organisations with advanced technological capabilities occupy privileged positions within the economic structure. The analysis shows that innovation-driven economies create various interrelated types of digital inequality. These include spatial inequalities between capital cities and peripheral regions, gender disparities in access to venture capital, and structural inequalities in access to entrepreneurial networks and technological resources. Together, these dynamics constitute cognitive stratification, reflecting unequal access to knowledge, digital skills, and innovation infrastructure in the contemporary knowledge economy.

Startup ecosystems play a central role in shaping this emerging form of stratification. Although they generate new opportunities for innovation and entrepreneurship, they also lead to the accumulation of economic power in the hands of a small number of highly successful technology firms and entrepreneurs.

#### 5. Conclusions

Artificial sociality, as a new social paradigm, is still in the process of formation; therefore, its study requires an integrated approach. To achieve a thorough understanding of this phenomenon and its impact on social processes, the scientific community should focus on the following areas: developing interdisciplinary approaches that combine sociology, cybernetics and psychology; studying the cognitive, behavioural and emotional aspects of human interaction with digital agents; paying special attention to issues of ethics, security and legal regulation; conducting applied research focused on the practical application of

artificial sociality technologies in economics, education and public administration. The spread of artificial sociality, social machines and artificial intelligence (AI) is changing economic models, client interaction mechanisms, labour market structures and social policy principles. In order for businesses and government agencies to successfully adapt to these changes, it is necessary to take several strategic recommendations into account. Successful adaptation to the conditions of the social economy requires investment in digital transformation, the implementation of personalised digital solutions, the training of personnel in new competencies, compliance with the principles of ethics and data protection, and the development of regulatory and social support mechanisms.

These recommendations will help business representatives and government bodies adapt to changing conditions and use artificial sociality to increase competitiveness and promote sustainable development.

The development of artificial sociality in the social economy creates enormous opportunities to improve citizens' lives and increase the efficiency of social processes. However, it also poses significant risks that must be carefully analysed and controlled. To minimise possible threats and ensure sustainable development, it is important to develop ethical, fair and inclusive models. Among the most important and pressing areas

of research in the field of artificial sociality, in terms of their impact on the social economy, the following can be highlighted: analysing the impact of artificial sociality on the labour market (the creation of new models of employment, flexible forms of employment relationships and staff retraining systems); research into the economic efficiency of digital platforms (the development of business adaptation strategies and the regulation of the platform economy), development of social responsibility standards for digital agents and algorithms (minimising the risks of manipulation, discrimination and economic inequality). These research areas have high potential for practical application and will be in demand in the coming years in both academia and the real economy.

**Author contributions:** Conceptualisation, VM and OR; methodology, OR; software, OR; validation, VM, OR and JS; formal analysis, JS; investigation, VM, OR and JS; resources, OR; data curation, VM and JS; writing – original draft preparation, VM; writing – review and editing, JS; visualisation, OR; supervision, VM; project administration, OR; funding acquisition, VM. All of the authors have read and agreed to the final version of the manuscript.

**Conflict of interest:** The authors declare no conflict of interest.

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Received on: 15th of March, 2026

Accepted on: 07th of May, 2026

Published on: 29th of May, 2026