The Digital Entrepreneurship Ecosystem Index

Global Report

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Executive Summary

At the Vienna Institute for Global Studies (VIGS), we seek to understand how digitalization transforms economies, societies, and the very nature of entrepreneurship. To this end, we have developed the Digital Entrepreneurship Ecosystem (DEE) Index, a comprehensive framework that captures the interplay of infrastructure, users, platforms, institutions, and entrepreneurial actors. Applied globally across 170 countries, the DEE Index provides a detailed picture of progress, persistent bottlenecks, and opportunities for inclusive and innovation-driven growth.

Our analysis reveals that countries worldwide have made substantial progress in building digital infrastructure and fostering user citizenship between 2017 and 2022. Broadband expansion, mobile penetration, cybersecurity regulation, and digital literacy have all improved markedly, creating a stronger foundation for digital participation. At the same time, however, entrepreneurial activation remains uneven. The capacity of startups to scale, of firms to absorb new technologies, and of platforms to orchestrate innovation lags in many regions, with the most visible gaps found in finance, matchmaking, and the broader development of platform ecosystems.

High-income economies emerge as global benchmarks, consistently outperforming the world average across all dimensions of the DEE Index. Their relative maturity highlights the importance of institutional coherence, trust in regulation, and sustained investment in both infrastructure and entrepreneurship. These experiences demonstrate that strong digital foundations can be successfully translated into entrepreneurial dynamism, offering models for policy learning and international cooperation.

The global digital economy now stands at a turning point. With foundational infrastructures increasingly in place, the policy focus must shift from expanding access to enabling entrepreneurship. Future progress depends on coordinated strategies to improve access to venture finance, strengthen platform ecosystems, develop digital talent, and foster inclusive participation. Building cross-border innovation hubs and shared digital laboratories can help translate digital readiness into digital dynamism.

If pursued collectively, these steps would allow countries to unlock their digital potential, reduce dependence on external technological actors, and position themselves as competitive, innovation-driven ecosystems. The foundations for this transformation have been laid, however, the challenge ahead lies in turning them into sustainable entrepreneurial outcomes.

Prof. Dr. Zoltán Ács
Director of the Vienna Institute
for Global Studies (VIGS)

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1 The Global Digital Entrepreneurship Ecosystem

Highlights

Digital Entrepreneurship Ecosystem as a systemic transformation

The DEE Index redefines digital entrepreneurship as a system-level interaction between users, digital infrastructures, institutions, and entrepreneurial agents, not just as technology-enabled startups.

Global coverage and bottleneck focus

The DEE Index evaluates 170 countries over six years using pooled normalization and a penalty for bottlenecks, highlighting how weaknesses in any pillar can restrict overall ecosystem performance.

Top performers show ecosystem balance

The United States, Denmark, and the United Kingdom lead the DEE rankings, combining strong digital infrastructure with entrepreneurial agency, financial access, and institutional support.

Rapid global growth

Between 2020 and 2022, global DEE scores increased by 7.3%, driven especially by improvements in digital privacy, literacy, and financial facilitation.

Entrepreneurial agency remains the main global bottleneck

While infrastructure and platforms advanced rapidly, Digital Technology Entrepreneurship grew only 3.53% per year, indicating persistent gaps in startup/scaleup support and financial facilitation.

1.1 The Digital Entrepreneurship Ecosystems

Digitalization is among the most transformative forces of the 21st century, reshaping how people live, interact, and conduct business. Known as the Fourth Industrial Revolution, this shift is powered by connectivity, cloud computing, artificial intelligence, and data analytics (Lasi et al., 2014; Dwivedi et al., 2021). Organizationally, digital transformation entails reconfiguring internal processes and strategies to support innovation and agility (Matt et al., 2015; Vial, 2021).

This transformation has given rise to Digital Entrepreneurship Ecosystems (DEEs), defined by interactions between users, platforms, institutions, and entrepreneurial agents across globally networked environments (Sussan and Acs, 2017; Autio et al., 2018). Unlike traditional ecosystems grounded in geography, DEEs emphasize distributed participation. Users act not only as consumers but also as co-creators of innovation (Nambisan, 2017).

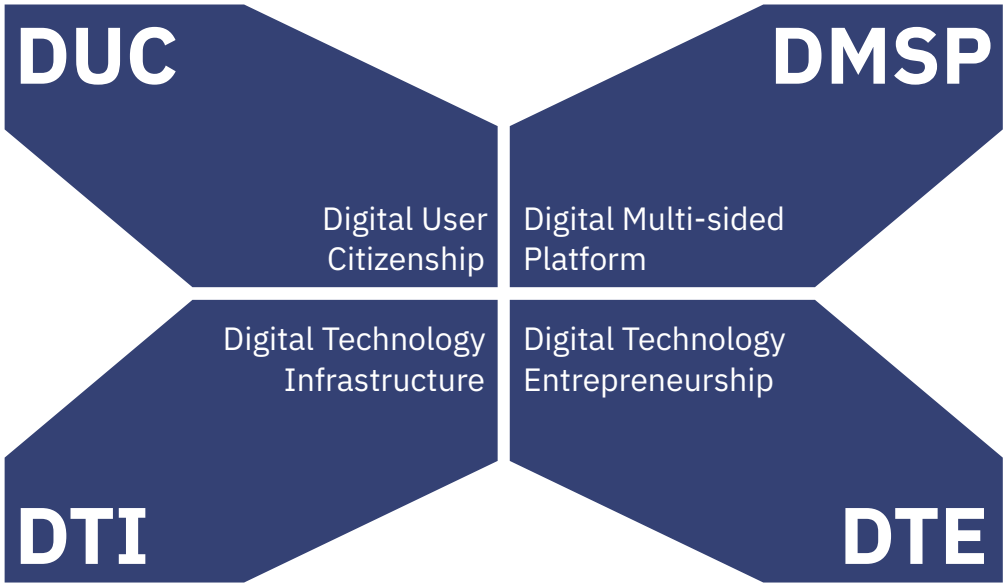
DEE research connects these ecosystems to outcomes beyond business formation, including digital inclusion, sustainability, and wellbeing (Elia et al., 2021; van Dijk, 2017). Enabled by digital platforms, APIs, and modular technologies, entrepreneurial agency extends across developers, investors, accelerators, and the technologies themselves.

Based on this foundation, we provide the following definition of the Digital Entrepreneurial Ecosystem:

Digital Entrepreneurial Ecosystem is a dynamic and territorially embedded system arising from the intersection of the digital ecosystem—comprising users and digital infrastructures—and the entrepreneurial ecosystem, which includes institutions and entrepreneurial agents. The dynamic interactions among the twelve DEE components/pillars determine their functioning within the DEE and how they contribute to the emergence of digital products, artifacts, startups, and scaleups.

The DEE should be understood as complex, adaptive systems with evolving structures, contingent trajectories, and varying degrees of inclusivity and effectiveness across different territorial contexts.

To measure DEE performance, the Digital Entrepreneurship Ecosystem Index (DEE Index) was developed. Covering 170 countries, it evaluates four key pillars:



DEE Index

Digital Entrepreneurship Ecosystem Index

170

countries

4

key pillars

A central innovation of the approach by Sussan and Acs (2017) was the recognition of users not merely as consumers, but as co-creators of value within the technology-led entrepreneurial process. This repositioning of users as active participants represented a significant departure from earlier EE conceptualizations, which positioned entrepreneurs and firms as the sole agents responsible of value creation processes. Therefore, the DEE model reframed the entrepreneurial scenario by including in the model participatory dynamics, platform-mediated interactions, and multi-actor value co-production processes.

Figure1

The Digital Entrepreneurship Ecosystem (DEE) framework

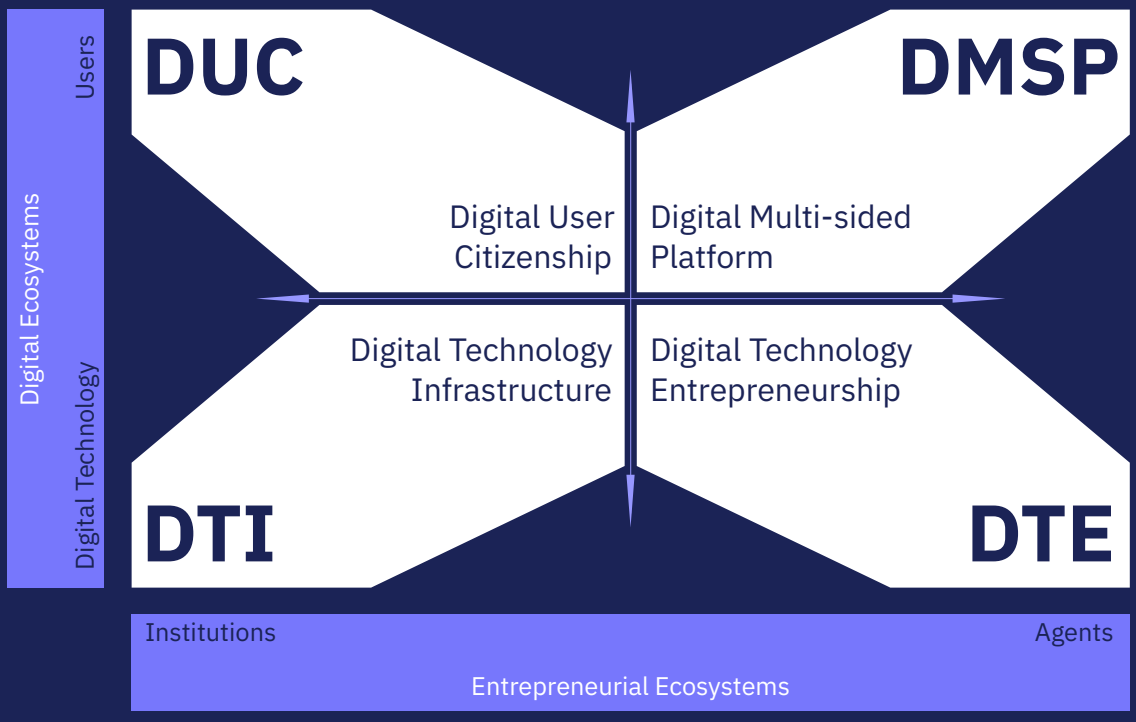
Song (2019) framework — Components of the Digital Entrepreneurship Ecosystem

Notes: This figure conceptualizes the components of the Digital Entrepreneurship Ecosystem (DEE), integrating digital and entrepreneurial domains.

Source: Adapted from Song (2019).

Building on this foundational work, Song (2019) refined the conceptual architecture of the DEE by embedding digital platform logic more deeply into the analysis. Introducing the construction of Digital Technology Entrepreneurship, Song underlined the heterogeneity of platform-based agents (including developers, intermediaries, and users) and their respective roles in shaping entrepreneurial activity. Song redefined the Digital Marketplace with the Digital Multi-sided Platforms that act as transactional facilitators and infrastructures that mediate knowledge flows, foster entrepreneurial experimentation, and lower institutional and technological barriers to entry. From this perspective, platforms are not merely market mechanisms but also key players of the institutional framework that support innovation, dynamic learning, and complex entrepreneurial interactions.

The DEE calculation method uses a "penalty for bottleneck" methodology, acknowledging that underperformance in any one pillar can hinder overall functionality (Szerb et al., 2022).



1.2 The DEE Structure

The DEE Index is structured around four sub-indices, each representing a critical dimension of the interaction between digital infrastructure and the entrepreneurial ecosystem. Together, these sub-indices encompass twelve pillars, which collectively assess the systemic enablers and constraints of digital entrepreneurship within a specific territorial context. Each pillar reflects a distinct but interconnected component of the digital entrepreneurial environment, ranging from foundational infrastructure and user engagement to entrepreneurial innovation, firm growth, and value generation. The following table offers an overview of the pillars and associated variables, underscoring the pillars as the core structural elements of the DEE Index.

The selection of sub-indicators was guided by three key criteria. First, relevance, referring to the sub-indicator's ability to meaningfully capture the specific aspect of the digital entrepreneurship phenomenon being measured. Second, specificity, which ensures that each sub-indicator accurately reflects the particular construct it is intended to represent, avoiding overlap or conceptual ambiguity. Third, clarity of interpretation, emphasizing the importance of unambiguous meaning and the potential for consistent understanding and application across different contexts and users.

Table1

Digital Entrepreneurship Ecosystem Pillars, Roles, Variables and Content

DTI

Digital Technology Infrastructure

Pillars	Role in the DEE	Variables	Variable content
Digital openness	Ensures institutional support for equitable access to and use of digital infrastructure, fostering broad-based participation.	▪ Digital openness institutions ▪ Digital openness technology	Capturing ICT and internet regulation, population use of G2-G5 networks, % of frequency coverage
Digital competition	Promotes fair and innovation-friendly markets through regulation and rivalry, mitigating risks of digital monopolization.	▪ Digital competition institutions, ▪ Digital competition technology	Business freedom, regulatory quality, mobile tariffs, handset prices
Digital security	Provides legal and technological protections that build trust and safeguard users and systems from cyber threats.	▪ Digital security institutions, ▪ Digital security technology	ICT competition, measuring law and regulations on cybercrime and cybersecurity, Secure Internet servers per million population

DUC

Digital User Citizenship

Pillars	Role in the DEE	Variables	Variable content
Digital literacy	Enables individuals to actively participate in, benefit from, and contribute to digitally enabled entrepreneurial processes through essential digital competencies.	▪ Digital literacy institutions, ▪ Digital literacy users	Human capital, eparticipation, digital skills among population
Digital privacy	Ensures safe and trustworthy participation in digital world through the protection of personal data and user autonomy.	▪ Digital privacy institutions, ▪ Digital privacy users	Laws and regulations on cybercrime and cybersecurity; government cybersecurity capacity, % of households with computer and internet access
Digital rights	Guarantees users' freedom to access, express, and innovate in digital spaces through the enforcement of fundamental civil and digital liberties.	▪ Digital rights institutions, ▪ Digital rights users	Personal rights, fundamental rights, internet nd intellectual propertyrights, % of individuals using the internet, gender gap in mobile ownership

DMSP

Digital Multi-sided Platform

Pillars	Role in the DEE	Variables	Variable content
Networking	Leverages network effects to scale value co-creation between users and agents through platforms, social media, and virtual services.	▪ Networking agents, ▪ Networking users	Locally developed apps, language support, social media use, e-government firms with website
Matchmaking	Facilitates efficient connections between users and agents, enabling decentralized exchanges and interactive entrepreneurial collaboration.	▪ Matchmaking agents, ▪ Matchmaking users	Number of developers and organizations, alternative financing, mobile ownership, % used mobile internet to buy something
Financial facilitation	Expands access to digital financial services, supporting inclusive and scalable digital entrepre-neurial activity.	▪ Financial facilitation agents, ▪ Financial facilitation sers	Financial technology businesses, active mobile broadband, used credit/debit card, made or received digital payments

DTE

Digital Technology Entrepreneurship

Pillars	Role in the DEE	Variables	Variable content
Digital absorption	Measures the capacity of existing firms and actors to internalize and apply digital echnologies, driving intrapreneurial innovation.	▪ Digital absorption agents, ▪ Digital absorption technology	Access to finance, skills, techni-cians, computer education, mobile speed, access to electricity
Digital startup	Reflects the various agency support mechanisms that enable the emergence and early growth of ventures built around digital innovation.	▪ Digital startup agents, ▪ Digital startup technology	Early phase VC, researchers, top-tier engineering education, in-cubators, accelerators, coworking, venture capital, startup regulation, support, R&D
Digital scaleup	Captures the agency support that enable digital ventures to scale rapidly into highgrowth, high-impact firms.	▪ Digital scaleup agents, ▪ Digital scaleup technology	Later phase VC, managers, top business education, supporting services, top city-level co domains, tech centers, mentoring network

2

The Digital Entrepreneurship Ecosystem Index: Country rankings and regional performances

87.9

DEE score

United States

the highest globally in 2022

84.8

DEE score

Denmark and the United Kingdom

the second-ranked countries worldwide. Five European countries are among the top ten in the DEE ranking.

Based on the DEE scores

scores computed for 170 countries, this section provides a descriptive analysis of global, regional, and temporal patterns. We begin by presenting the 2022 country rankings in Table 2, followed by an assessment of regional performances and their evolution over time in Subsection 2.1. This subsection also includes the changes in DEE scores between 2017 and 2022, illustrated in Figure 3.Subsection 2.2 deepens the analysis by examining cross-country disparities and distributional dynamics in DEE performance. While subsection 2.3 extends the analysis by offering projections of DEE growth, highlighting expected future trajectories across world regions.

According to Table 2, the United States shows the strongest performance in the DEE index (DEE for 2022: 87.9). This reflects a highly developed innovation and entrepreneurship landscape, underpinned by a dynamic private capital market characterized by the highest levels of venture capital investment globally, as well as robust support for startups and emerging technologies. Denmark, one of the EU's most digital economies with 94% of citizens actively using online services (US Department of Commerce, 2024), and the UK are the second-ranked countries with a DEE score of 84.8.

Five European countries—namely, the Netherlands, Sweden, Switzerland, Norway, and Finland—are also among the top ten in the DEE ranking. Singapore ranks fifth (DEE in 2022: 82.7), benefiting from a pro-business regulatory environment, strong legal institutions, and a highly skilled and diverse talent base (Financial Times, 2024). Australia ranks eighth (DEE in 2022: 81.5), further consolidating the presence of high-income economies in the top tier of the ranking. Among the countries ranked 11th to 20th, European economies remain predominant, occupying seven of the top positions. Notable exceptions include Canada (DEE in 2022: 78.1, ranked 12th), South Korea (DEE in 2022: 73.6, ranked 16th), and New Zealand (DEE in 2022: 72.3, ranked 20th). In the case of South Korea, its performance can be attributed in part to recent government-led initiatives and policy investments aimed at fostering entrepreneurship, particularly in Seoul (World Economic Forum, 2025).

In contrast, the ten lowest-ranked countries, in terms of the DEE results, are concentrated in Sub-Saharan Africa (e.g., Central African Republic), South Asia (e.g., Afghanistan), and the Middle East and North Africa (e.g., Yemen), reflecting persistent structural challenges in digital infrastructure, institutional capacity, and entrepreneurial support systems.

Table2

DEE Country Rankings (2022)

Rank. Country DEE scores for 2022

1. United States of America 87.9
2. Denmark 84.8
3. United Kingdom 84.8
4. Netherlands 82.7
5. Singapore 82.7
6. Sweden 82.1
7. Switzerland 81.9
8. Australia 81.5
9. Norway 81.2
10. Finland 80.9
11. Germany 79.1
12. Canada 78.1
13. Ireland 75.7
14. Estonia 74.5
15. France 74.1
16. Korea, South 73.6
17. Spain 73.5
18. Iceland 73
19. Luxembourg 72.6
20. New Zealand 72.3
21. Austria 72
22. Belgium 71.4
23. Japan 70
24. Italy 67.4
25. Hong Kong 65.9
26. Israel 65.3
27. Portugal 64.8
28. Cyprus 64.8
29. Czechia 64.6
30. Lithuania 64.1
31. Latvia 62.1
32. Slovenia 60.5
33. Poland 60.3
34. United Arab Emirates 60.2
35. Malta 60
36. Greece 59.8
37. Chile 58.6
38. Slovakia 57.8
39. Hungary 57.7
40. Uruguay 56.2
41. Bulgaria 54.7
42. Croatia 54.3
43. Brazil 53.8
44. Romania 52.9
45. Malaysia 52.6
46. Argentina 49.8
47. Turkey 48.4
48. Saudi Arabia 47.8
49. China 47.8
50. Qatar 47.7
51. Russian Federation 47.5
52. Serbia 47.1
53. Bahrain 47
54. Costa Rica 45.6
55. Georgia 45.1
56. Ukraine 44.8
57. Mexico 44.2
58. Thailand 43.8
59. South Africa 43.4
60. Mauritius 42.5
61. Brunei Darussalam 41.8
62. North Macedonia 41.7
63. Vietnam 40.8
64. Kuwait 40.3
65. Kazakhstan 40.2
66. Colombia 39.7
67. Panama 39.3
68. Mongolia 38.9
69. Bahamas 37.9
70. Oman 37.8
71. Montenegro 37.8
72. Indonesia 37.6
73. Moldova 37.2
74. Armenia 37.2
75. Peru 36.4
76. Albania 36.2
77. Jordan 36.1
78. Ecuador 35
79. Trinidad and Tobago 34.7
80. Philippines 34.1
81. Belarus 33.9
82. Barbados 33.7
83. Morocco 32.5
84. India 31.6
85. Bosnia and Herzegovina 31.3
86. Azerbaijan 31.3
87. Tunisia 31.2
88. Samoa 31
89. Dominican Republic 30.4
90. Iran 30.2
91. Saint Vincent and the Grenadines 29.9
92. Egypt 29.5
93. Cabo Verde 28.8
94. Paraguay 28.5
95. Maldives 28.2
96. Fiji 28.2
97. Jamaica 28
98. Sri Lanka 27.8
99. Saint Lucia 27.6
100. Suriname 27.4
101. Botswana 27.3
102. Kyrgyzstan 26.3
103. Uzbekistan 26.2
104. Kenya 25.9
105. Ghana 25.5
106. Lebanon 24.9
107. Bolivia 24.3
108. Guyana 24.3
109. Bhutan 23.9
110. Belize 23.6
111. Algeria 23.2
112. El Salvador 23.1
113. Vanuatu 22.3
114. Venezuela 20.7
115. Bangladesh 20.7
116. Tonga 20.6
117. Iraq 20
118. Senegal 20
119. Pakistan 19.9
120. Nepal 19.9
121. Namibia 19.2
122. Nigeria 19.2
123. Cambodia 19.2
124. Guatemala 19.1
125. Honduras 18.2
126. Gabon 18.2
127. Cote d'Ivoire 16.6
128. Nicaragua 16.6
129. Zambia 16.2
130. Libya 16.1
131. Eswatini 15.8
132. Tanzania 15.4
133. Myanmar 15.3
134. Rwanda 15.3
135. Cameroon 15
136. Timor-Leste 14.8
137. Uganda 14.4
138. Laos 14
139. Togo 13.7
140. Lesotho 13.4
141. Solomon Islands 13
142. Zimbabwe 12.9
143. Benin 12.3
144. Gambia 12.1
145. Papua New Guinea 11.9
146. Angola 11.7
147. Mali 10.4
148. Malawi 9.9
149. Tajikistan 9.4
150. Mozambique 9.3
151. Sudan 9.2
152. Ethiopia 9
153. Madagascar 8.3
154. Mauritania 8.2
155. Sierra Leone 8.1
156. Burkina Faso 7.6
157. Haiti 7.5
158. Comoros 7.4
159. Congo 7.3
160. Guinea 6.6
161. Afghanistan 6.6
162. Congo, Democratic Republic 6.5
163. Liberia 6.4
164. Guinea-Bissau 5.7
165. Niger 5.5
166. Yemen 5.1
167. Chad 5
168. Burundi 4.9
169. South Sudan 2.8
170. Central African Republic 1.9

2.1 Evolution of the Global DEE Performance

This subchapter examines how the Digital Entrepreneurship Ecosystem (DEE) has developed worldwide between 2017 and 2022 by analyzing longitudinal regional trends and structural changes in the index. Through comparative evaluation of regional averages and subindex trajectories, the section highlights both the steady global improvement in digital ecosystem performance and the heterogeneous pace of development across regions. Overall, the subchapter provides an integrated overview of global DEE evolution, pointing to both incremental consolidation in digitally mature regions and accelerated catch-up dynamics in developing ones.

Figure2

Change of DEE score average over 2017–2022

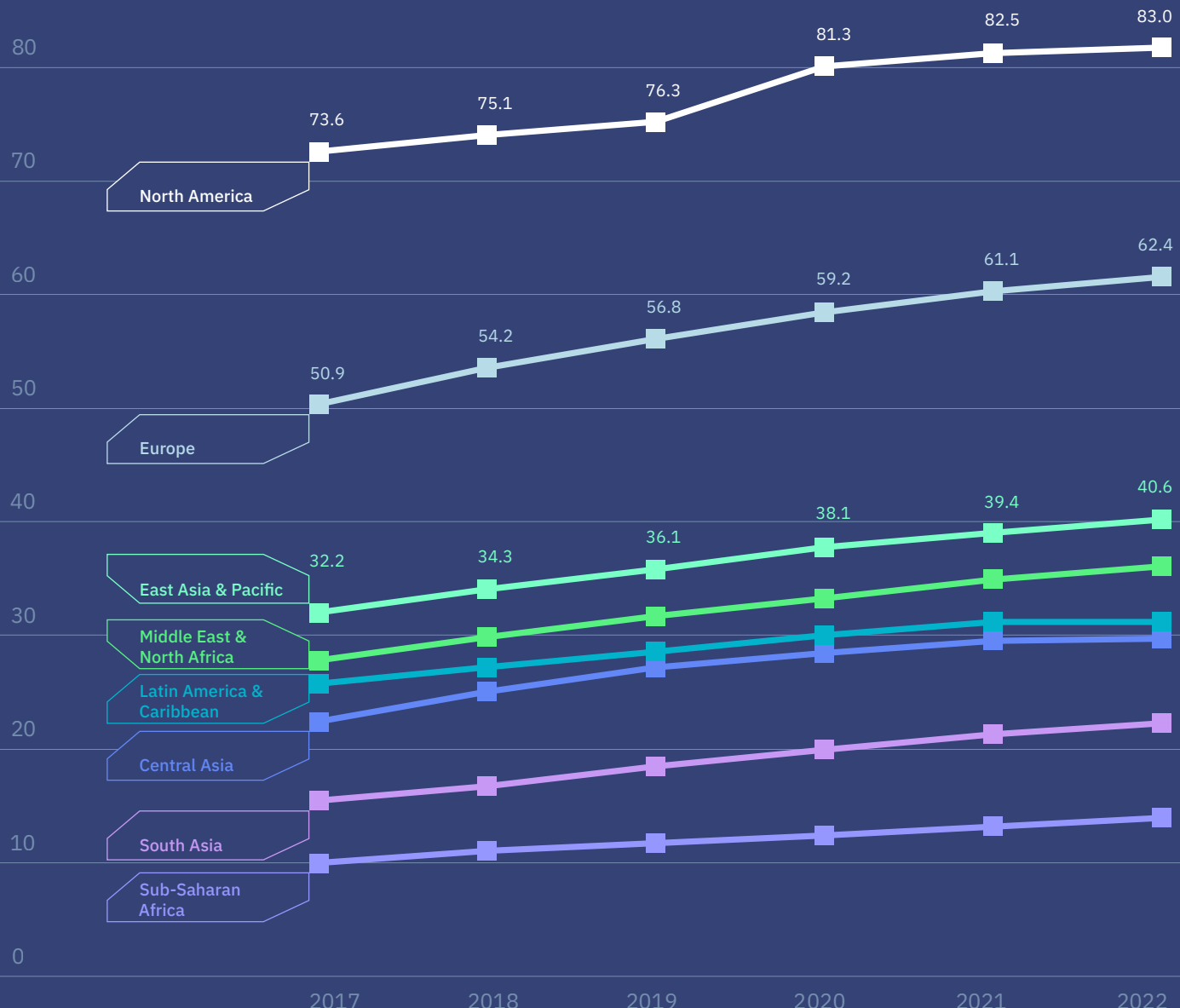
Regional trends in Digital Entrepreneurship Ecosystem Index scores

Note: The figure displays regional averages of the DEE super-index on a 0–100 scale for the period 2017–2022, highlighting both absolute differences in performance and the upward trend across all world regions.

Source: VIGS Institute, 2025.

Longitudinal data allows us to compare regional changes in digital entrepreneurship ecosystem performance over time. One can observe in Figure 2 an incremental increase in the super-index in every region's score.

Over 2017–2022, Europe's average DEE score nominally increased the most, from 50.9 to 62.4, representing an 11.5-point improvement. North America also experienced a substantial rise, from 73.6 to 83.0 (+9.4 points), followed by the Middle East and North Africa, which increased from 27.9 to 36.4 (+8.5 points). East Asia & Pacific reported a similar increase of 8.4 points (from 32.2 to 40.6). Meanwhile, Sub-Saharan Africa, which had the lowest starting score, also experienced the lowest nominal rise, increasing only 4.1 points (from 9.7 to 13.8). This pattern suggests that regions with higher starting scores tend to develop their ecosystems faster in absolute terms. However, this longitudinal change does not fully reflect relative development: Sub-Saharan Africa's 4.1-point increase represents a 42.27% growth from 2017 to 2022, while Europe's 11.5-point increase corresponds to a 22.58% rise over the same period. This indicates that despite lower absolute gains, initially lagging regions are progressing proportionally faster.



12.87%

lowest cumulative DEE growth

North America

still the global leader in absolute DEE level

22.45%

cumulative DEE growth

Europe

ranking second globally

To complement this structural view, Figure 3 presents, for each region, the cumulative growth of the DEE between 2017 and 2022, split into two sub-periods: 2017-2020 and 2017-2022.

The analysis reveals substantial heterogeneity in the evolution of the DEE across regions and across time. For the analyzed period, Africa showed the most significant cumulative growth in the DEE (42.87%), followed by Central Asia (36.90%) and the Middle East (28.93%). Africa's strong growth trajectory, especially between 2017 and 2020, reflects initial progress in digital infrastructure and user citizenship, although it remains the lowest-performing region in terms of absolute DEE values. On the contrary, North America recorded the lowest cumulative growth (12.87%); however, this region continues to lead globally in terms of the DEE level.

Europe ranks second in DEE performance globally, with a cumulative DEE growth rate of 22.45%. Its balanced expansion across the four DEE sub-indices is constrained by the absence of an integrated capital market and fragmentation in R&D funding, which limit the commercialization of innovation. Oceania and the Pacific (22.55%) and Latin America and the Caribbean (26.49%) show moderate improvements in their DEE levels. However, structural issues such as weak later-stage funding and dependency on resource-based industries limit ecosystem scalability in these regions.

The Middle East, East Asia, and Central Asia exhibit robust growth in digital entrepreneurship and digital technology infrastructure. East Asia, led by economies such as China, has demonstrated significant gains in multi-sided platforms and digital technology entrepreneurship, fueled by growth in strategic sectors like AI and electronics manufacturing. Nevertheless, challenges such as digital inclusion gaps and weak financial ecosystems persist across developing regions.

The cumulative changes in DEE reported in the figure illustrate how developing regions are accelerating progress in foundational areas, while developed ones are advancing more incrementally in a saturated digital landscape. The figure also suggests a pattern of 'digital convergence', as less developed regions—such as Africa, Central Asia, and the Middle East—show the highest relative growth rates in DEE between 2017 and 2022. This faster growth among initially lagging regions may signal a catching-up process, where improvements in infrastructure, digital literacy, and entrepreneurship enable accelerated development. While absolute gaps remain, the data support the notion that digital entrepreneurial ecosystems are gradually converging, particularly where targeted policies and investments foster foundational digital capabilities and support digital entrepreneurship activity.

Figure3

Relative growth of DEE scores compared to the base year of 2017

Comparative regional DEE Index growth between 2018 and 2022

Note: The bars show cumulative percentage growth in regional DEE scores relative to the 2017 baseline, distinguishing the periods 2017–2020 and 2017–2022. Arrows indicate the overall trajectory of regional catch-up or consolidation.

Source: VIGS Institute, 2025.

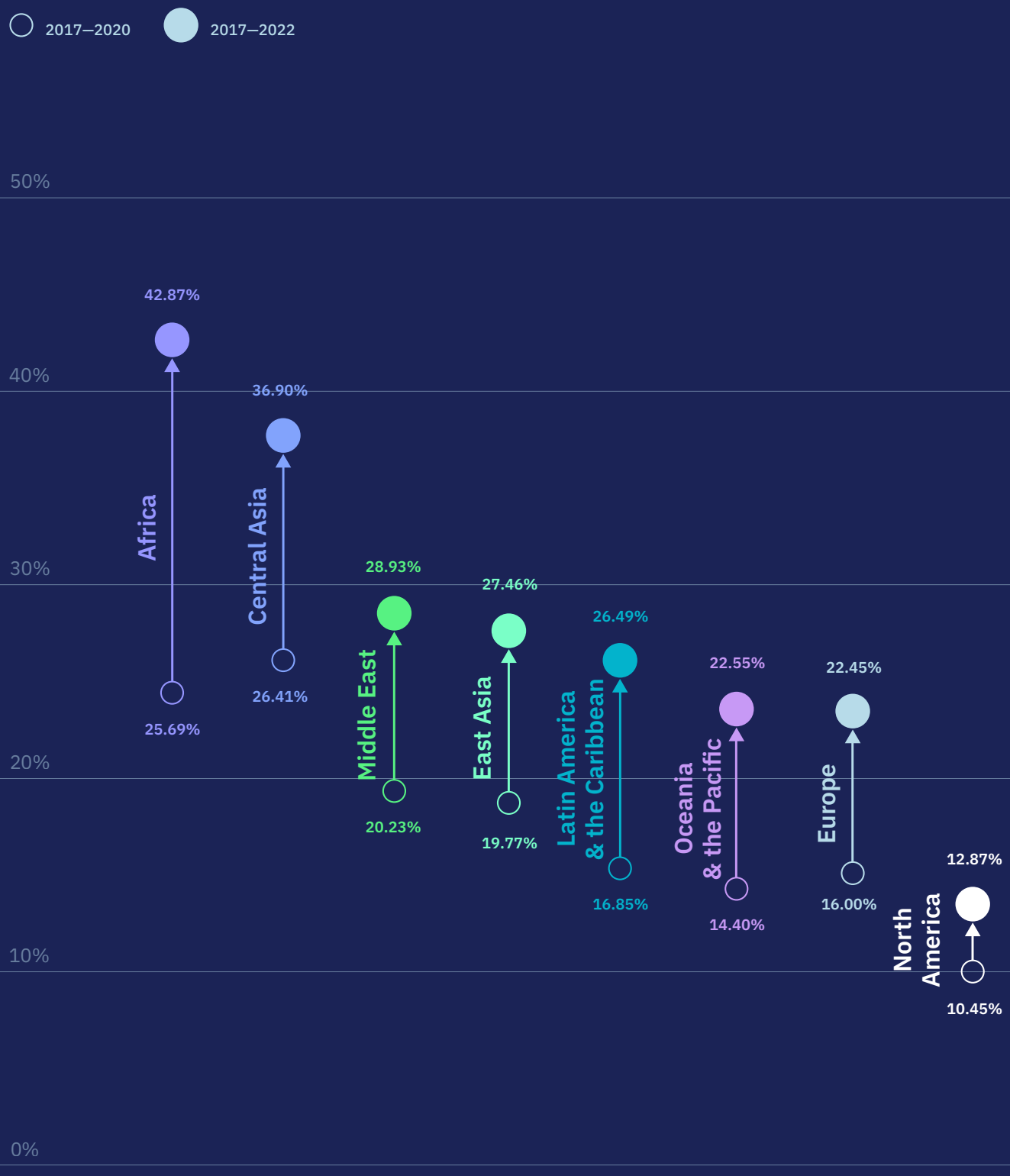


Figure4

DEE Subindexes between 2017 and 2022

Comparative changes in global subindex perfomance

Note: The lines report global average scores (0–100 scale) and trends for the four DEE sub-indices: Digital Technology Infrastructure (DTI), Digital User Citizenship (DUC), Digital Multi-sided Platforms (DMSP), and Digital Technology Entrepreneurship (DTE), showing steady improvement across all components, highlighting the gains in the DTI

Source: VIGS Institute, 2025.

The global averages show steady improvement across all Digital Entrepreneurship Ecosystem (DEE) subindices between 2017 and 2022 (Figure 4). The largest nominal increase is observed in Digital Technology Infrastructure (DTI), which rose from 28.7 in 2017 to 37.6 in 2022 (+8.9 points, +30.96%). Digital User Citizenship (DUC) also reports a substantial rise, increasing from 27.8 to 36.6 (+8.8 points, +31.59%), indicating growing digital literacy, online participation, and access among users. Digital Multi-sided Platforms (DMSP) increased from 28.0 to 35.9 (+7.9 points, +28.29%), showing continued strengthening of platform-based interactions and digital transactions, while Digital Technology Entrepreneurship (DTE) recorded the smallest nominal increase, rising from 30.7 to 36.1 (+5.4 points, +17.68%).

Overall, the global DEE score grew from 28.7 to 36.4 (+7.7 points, +26.83%), demonstrating broad-based global improvement. The consistent upward trend across all pillars indicates that digital development did not plateau but expanded simultaneously across infrastructure, user inclusion, platforms, and entrepreneurial activity, although entrepreneurship-related components evolved at a slower pace.

Figure5

Global progress across DEE pillars between 2017 and 2022

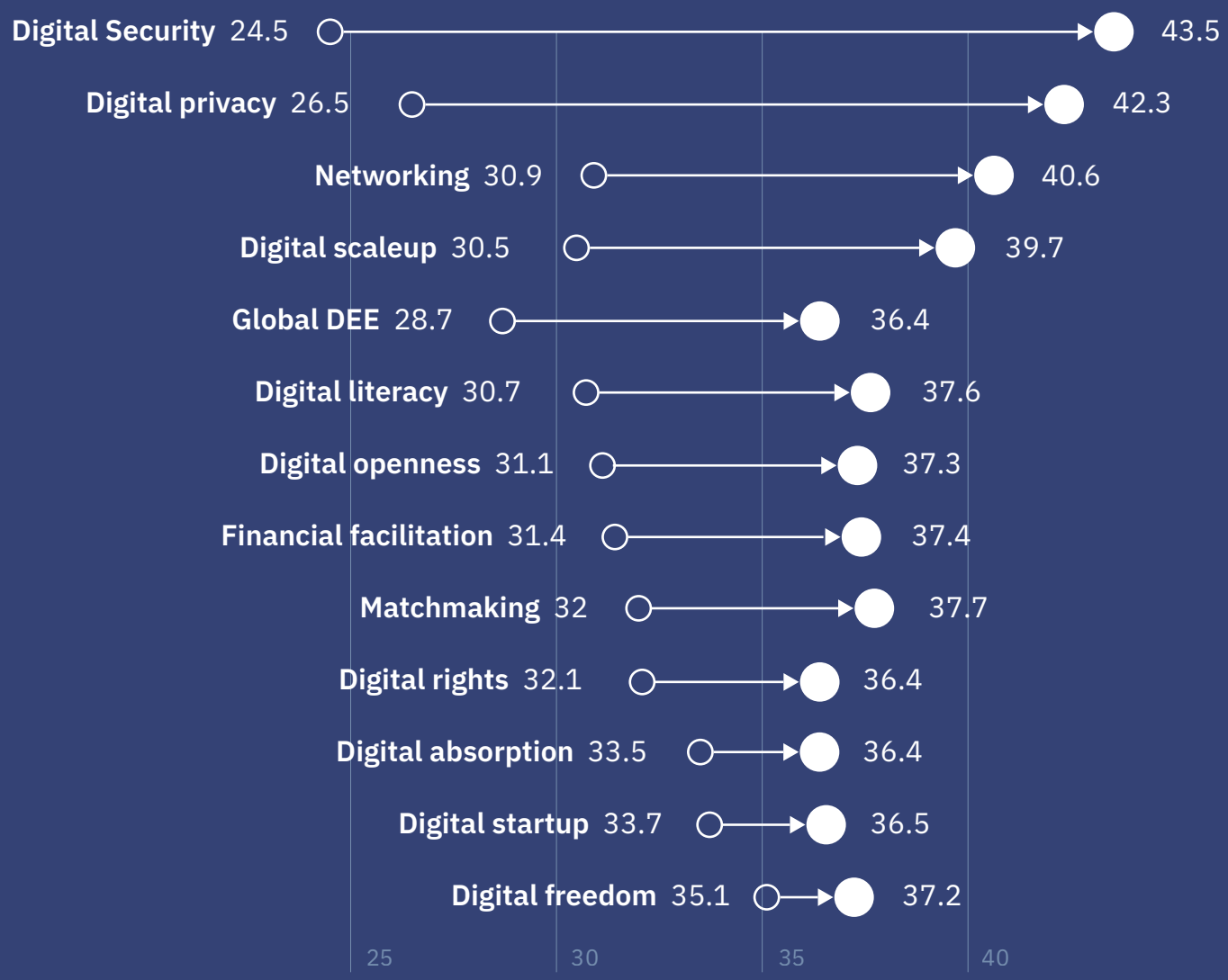
Comparative changes in pillar-level DEE performance, global averages

Note: The scores reflect global average performance across each pillar, highlights gains in Digital Privacy and Security.

Source: VIGS Institute, 2025.

The next figure shows the global average scores for each Digital Entrepreneurship Ecosystem (DEE) pillar in 2017 (○) and 2022 (●), illustrating structural changes in digital development over five years. The most dramatic improvements occurred in Digital Security and Digital Privacy, with increases of 19 and 15.8 points respectively, indicating that concerns around cybersecurity and data protection have become central to digital policy and infrastructure globally. Other pillars such as Networking, Digital Scaleup, and Digital Literacy also saw significant global improvement, reflecting investment in connectivity, capacity-building, and access. Interestingly, even pillars with relatively higher starting points such as Digital Competition and Digital Startup, continued to grow steadily, suggesting that maturity in digital ecosystems did not plateau but expanded across multiple dimensions.

The consistent upward trend across all pillars suggests a broad-based global acceleration in digital transformation, driven in part by the COVID-19 pandemic's catalysing effect. While less developed regions saw higher percentage growth from lower baselines, this global snapshot confirms that digital enablers are strengthening worldwide, particularly in security, privacy, and literacy—the same pillars identified as key structural drivers in the regional analysis.



2.2 Regional differences in DEE evolution

The next figure presents the relative change of each DEE pillar between 2017 and 2022 across world regions, highlighting substantial differences in the pace and direction of digital ecosystem development. The most pronounced increases are observed in Sub-Saharan Africa and South Asia, where Digital Privacy and Digital Security expanded by more than 200% in some cases. These dramatic relative improvements reflect rapid policy adoption, growing awareness of cybersecurity, and increased access to digital services in countries starting from very low initial levels.

Central Asia also reports strong percentage growth, particularly in Digital Security (+98%) and Digital Privacy (+90%), indicating that regulatory and institutional strengthening has become a regional priority. In contrast, North America and Europe show more modest percentage increases across most pillars, with growth generally below 40%, and in some cases close to zero. This pattern reflects their already high starting levels, where further progress requires more advanced technological development, institutional refinement, and innovation capacity rather than foundational expansion.

Across regions, Digital Security and Digital Privacy emerge as the fastest-growing pillars, confirming that cybersecurity, data protection, and trust-building mechanisms have become central enablers of digital transformation. Pillars related to entrepreneurial agency (such as Digital Startup Support and Digital Scaleup Support) show significantly slower growth worldwide, especially in developed regions, suggesting that the scaling of digital ventures remains a structural bottleneck in many ecosystems.

Overall, the percentage changes illustrate a global convergence trend: while absolute differences persist, regions with the lowest initial DEE levels are catching up the fastest in foundational areas such as security, privacy, literacy, and openness. This reinforces the conclusion that digital ecosystem development is broadening geographically, with foundational enablers strengthening across all regions, even though advanced entrepreneurial support mechanisms remain uneven.

Figure6

The changes of the pillars (%) in the world regions, 2017-2022

Comparative changes in pillar-level DEE performance, global averages

Note: The bars represent the percentage change in each DEE pillar between 2017 and 2022 by world region, highlighting very rapid relative improvements in Digital Security and Digital Privacy in latecomer regions, and more moderate growth in already mature ecosystems.

Source: VIGS Institute, 2025.

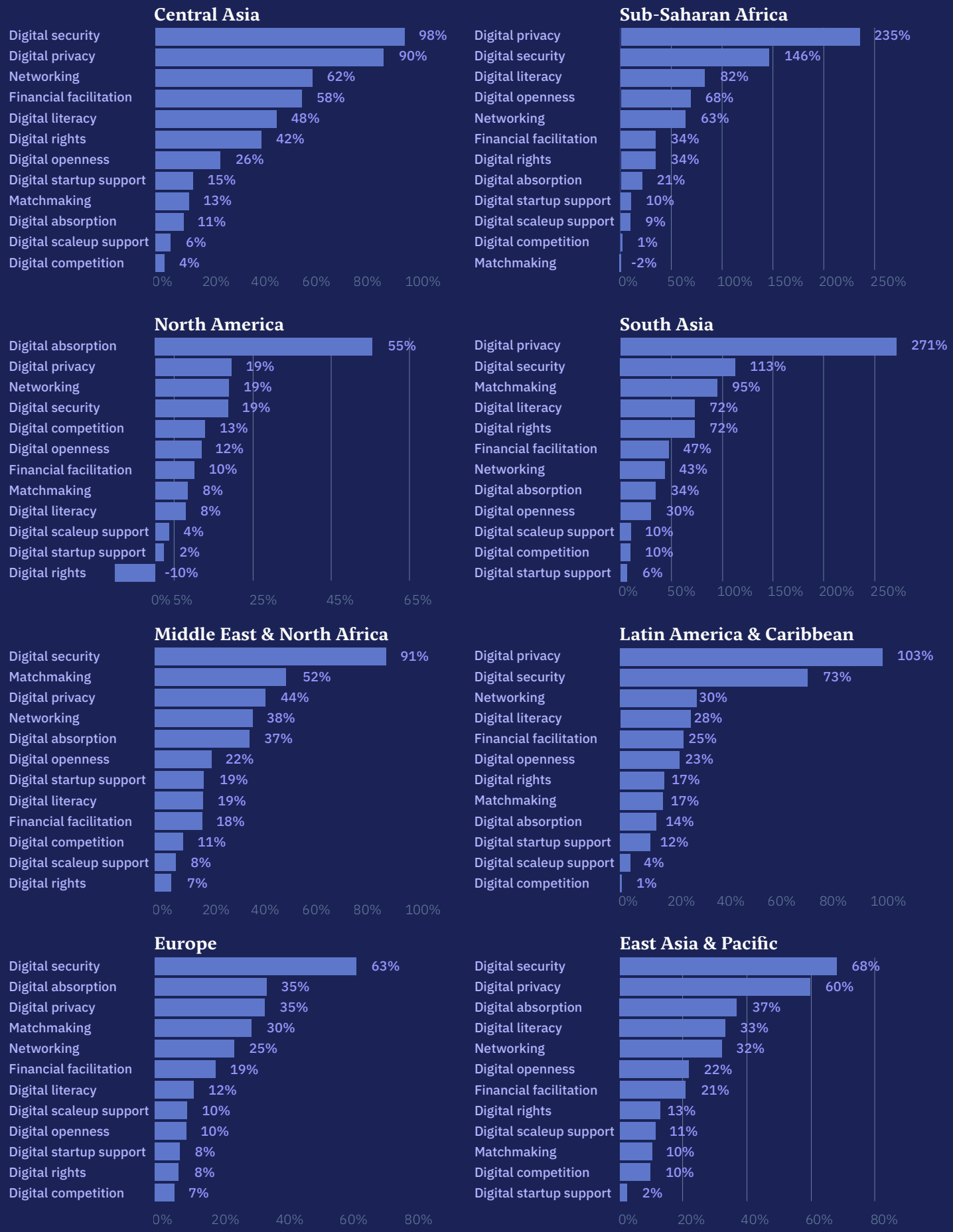


Figure 7: To illustrate the contrasting structures of the world's leading digital economies, Figure 7 presents the DEE pillar profiles of Denmark, the United States, Singapore, and Israel, revealing substantial differences in how their digital entrepreneurial ecosystems are configured.Denmark displays the most balanced profile, with consistently high scores across nearly all pillars, particularly in Digital Openness, Digital Startup Support, and Digital Scaleup Support. This configuration reflects a well-integrated policy framework, strong institutional support, and effective mechanisms for scaling digital ventures.

The United States shows exceptionally strong results in entrepreneurial agency pillars, especially Digital Scaleup Support and Digital Competition, confirming its position as the world's leading scaleup environment with a highly developed venture capital market and competitive innovation ecosystem. However, the United States performs comparatively lower in Digital Privacy and Digital Rights, indicating structural weaknesses in regulatory protection and governance frameworks. Singapore demonstrates a distinctive ecosystem configuration, combining very high performance in Digital Security, Digital Privacy, and Financial Facilitation with relatively lower results in Digital Openness and Digital Rights. This pattern is consistent with a state-driven digital governance approach that prioritizes secure infrastructure, financial technology development, and controlled digital environments.

Israel presents one of the strongest performances in Digital Technology Entrepreneurship pillars, particularly Digital Startup Support and Digital Absorption, reflecting its globally recognized innovation-driven structure and dense high-tech ecosystem. However, its lower scores in Digital Openness and Financial Facilitation suggest limitations in market accessibility and financial inclusiveness compared to the other leading economies.

Overall, the radar chart illustrates that while all four countries achieve high DEE performance, their strengths derive from different structural configurations: Denmark from systemic balance, the United States from scale and competition, Singapore from secure and financially driven digital infrastructure, and Israel from innovation intensity and entrepreneurial agency.

Figure 8 compares the DEE pillar performance of emerging digital economies (Chile, Georgia, South Africa, and India). Chile stands out as the strongest performer overall, with relatively high scores across most pillars, particularly in Digital Rights, Digital Privacy, and Digital Literacy. This pattern reflects Chile's advanced regulatory framework, strong digital governance, and comparatively high levels of user capability and trust in digital services.

Georgia presents a distinctive configuration characterized by strong performance in Digital Competition, Digital Security, and Digital Openness, indicating a liberalized digital market environment and significant progress in cybersecurity and institutional reforms. However, weaknesses in entrepreneurial agency pillars, such as Digital Scaleup Support and Financial Facilitation, suggest limitations in translating digital readiness into high-growth entrepreneurial outcomes.

South Africa demonstrates moderate results across several pillars, with notable strengths in Digital Security and Digital Competition, supported by a relatively dynamic private sector. Nonetheless, persistent weaknesses in Digital Absorption, Financial Facilitation, and Digital Scaleup Support highlight structural constraints related to infrastructure gaps, limited access to finance, and challenges in scaling digital ventures.

India displays the most polarized profile, with relatively high scores in Digital Competition and Digital Startup Support, driven by a rapidly expanding digital market, entrepreneurial activity, and government-led digital initiatives. However, extremely low levels in Digital Rights, Digital Privacy, and Digital Openness reveal significant regulatory and institutional weaknesses, limiting user protection and trust and potentially constraining sustainable ecosystem development.

The radar chart shows that emerging digital economies tend to exhibit specialized rather than balanced ecosystem structures, with strong development in selective areas but substantial deficiencies in others. This imbalance suggests that while these countries are progressing in market expansion and entrepreneurial activity, foundational governance and institutional support remain critical bottlenecks for long-term digital ecosystem maturation.

Figure7

DEE pillar performance of top leading countries

Comparative radar chart of DEE pillars: Denmark, United States, Singapore, Israel

Note: The figure shows DEE pillar-level strengths for the leading digital economies.

Source: VIGS Institute, 2025.

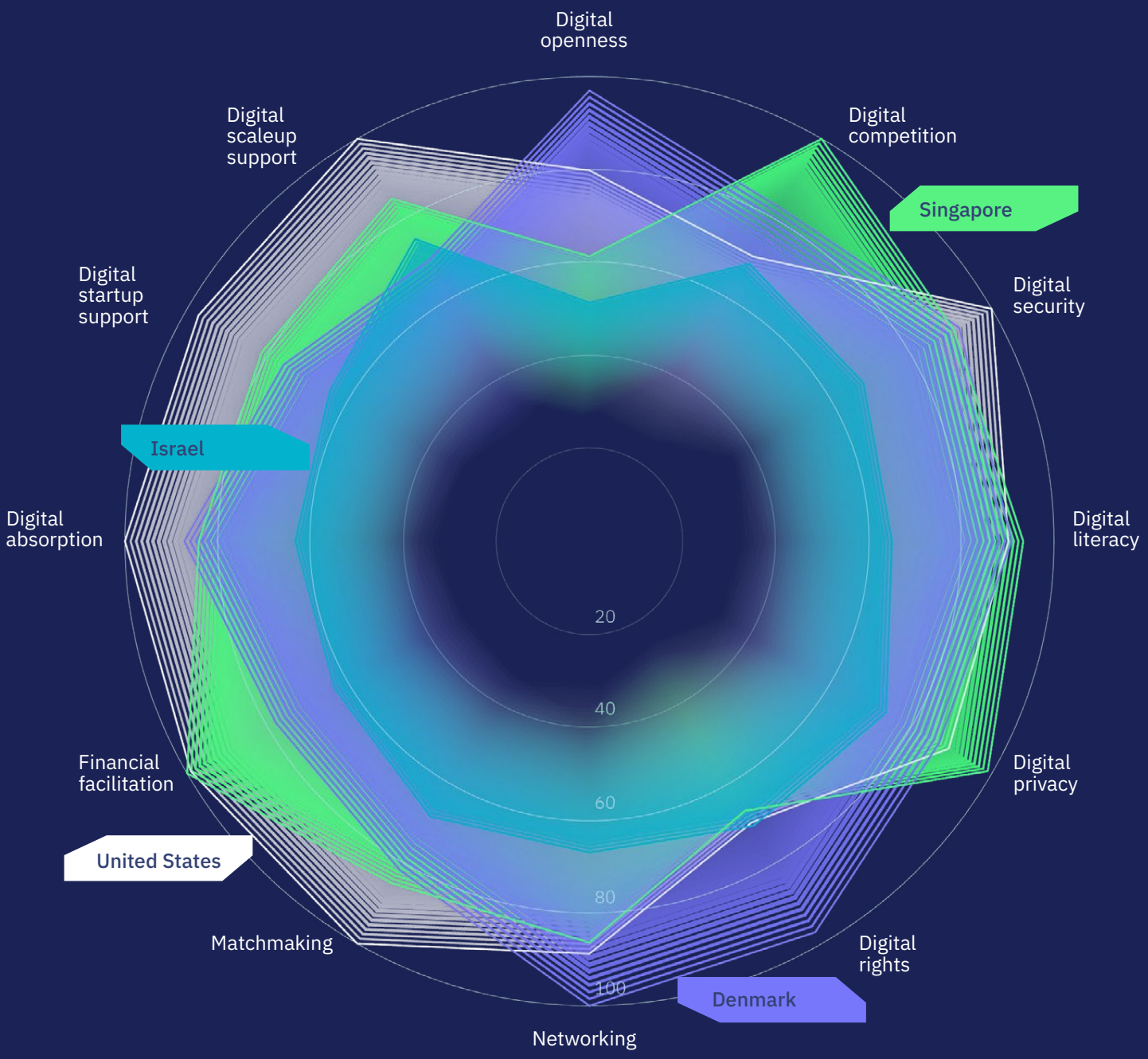


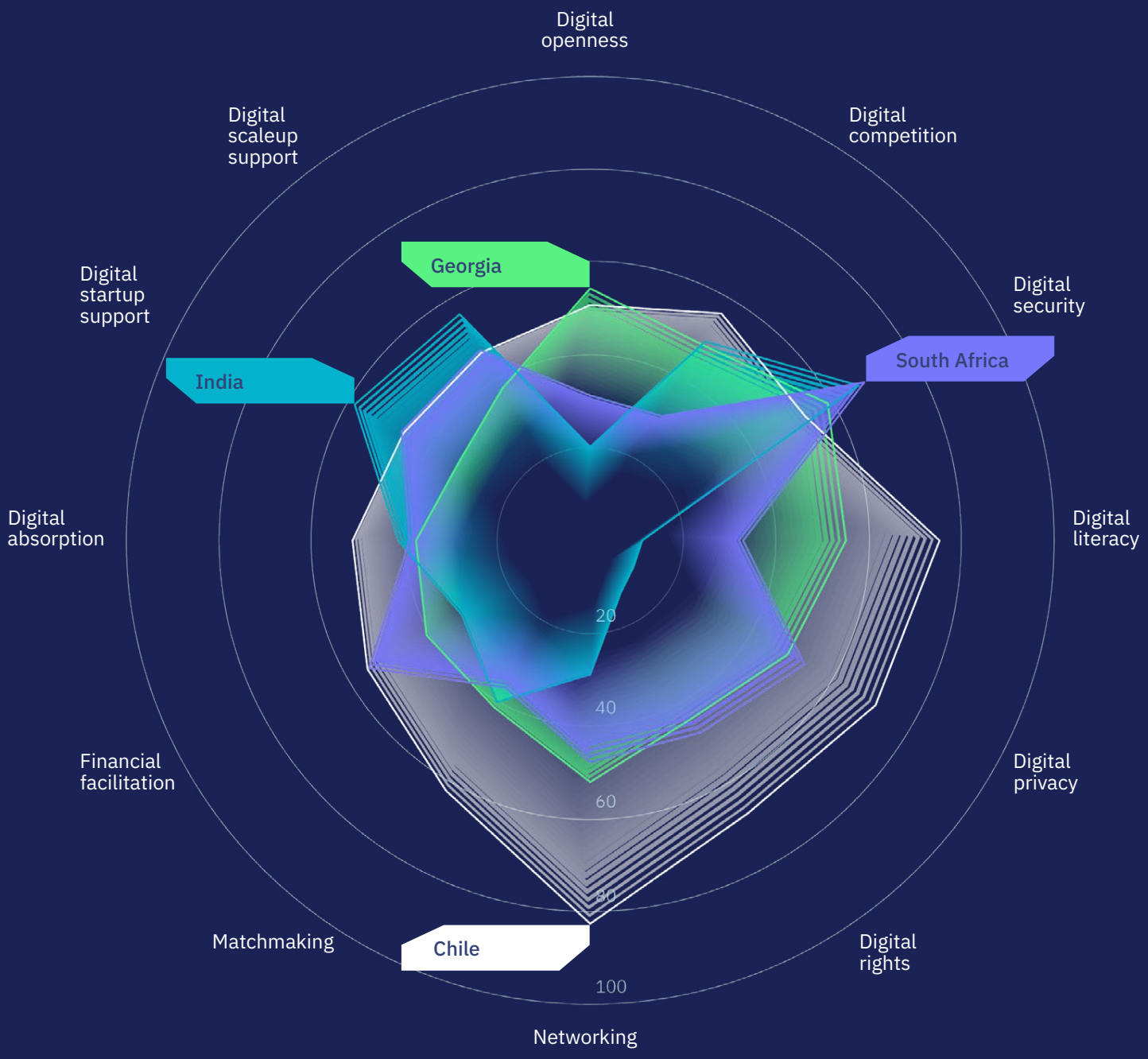
Figure8

DEE pillar performance of emerging digital economies

Comparative radar chart of DEE pillars: Chile, Georgia, South Africa, India

Note: The radar chart illustrates specialized rather than balanced ecosystem profiles, with strong performance in selected pillars but persistent gaps in governance, financial facilitation, or entrepreneurial scaling capacity.

Source: VIGS Institute, 2025.



2.3 Projection of DEE growth

This section introduces growth projections for the global DEE by evaluating how its pillars evolved from 2017 to 2022 and what these trends imply for future digital development. Table 3 shows a sustained upward trend in the global Digital Entrepreneurship Ecosystem (DEE) and its four subindices between 2017 and 2022. The strongest expansion is observed in Digital Technology Infrastructure (DTI) and Digital User Citizenship (DUC), which report average yearly growth rates of 6.18% and 6.35%, respectively. This reflects continued global investment in connectivity, broadband expansion, and increasing digital participation and skills among users.

Digital Multi-sided Platforms (DMSP) also show solid development, growing by an average of 5.67% per year, driven by the increasing adoption of platform-based services, digital transactions, and networked interactions. In contrast, Digital Technology Entrepreneurship (DTE) exhibits the slowest growth, averaging only 3.53% annually. This indicates that although digital capabilities and platform usage are expanding rapidly, the translation of these capacities into entrepreneurial outcomes—such as startup creation, scaleup support, and innovation commercialization—remains comparatively constrained.

Overall, the global DEE score increased from 28.7 in 2017 to 36.4 in 2022, representing an average yearly growth rate of 4.9%. Growth peaked in 2018 and 2019 (7.0% and 5.4%) but slowed after 2020, stabilizing at around 3–5% annually. This pattern suggests that early gains were driven by accelerated digital adoption, partly catalyzed by the COVID-19 pandemic, while more recent improvements reflect incremental consolidation rather than rapid expansion.

Table3

Global pillar scores and yearly growth, 2017–2022

Source: VIGS Institute, 2025.

Year	DTI	DUC	DMSP	DTE	DEE	Yearly growth
2017	28.7	27.8	28	30.7	28.7	
2018	31.6	30.1	29.5	31.9	30.7	7.0%
2019	33	32.5	31.4	32.9	32.3	5.4%
2020	34.5	34.9	32.8	34.1	34	5.0%
2021	35.6	36.2	34.8	35.2	35.3	4.0%
2022	37.6	36.6	35.9	36.1	36.4	3.1%
Yearly average growth	6.2%	6.4%	5.7%	3.5%	5.4%	4.9%

7.3%

Global DEE scores increase
Between 2020 and 2022

avg. 3.53%

DTE exhibits the slowest growth
annually

The percentage changes observed in the global DEE and its subcomponents reflect not only year-to-year improvement but a cumulative expansion of the digital economy's underlying capabilities. The relatively strong annual increases in DTI and DUC, which exceed 6% on average, indicate that improvements in digital infrastructure and user participation are progressing at a pace consistent with global diffusion patterns documented by the International Telecommunication Union and the World Bank (ITU, 2022; WorldBank, 2021). These developments suggest that many countries are moving toward more advanced stages of digital maturity, where earlier investments in connectivity and digital literacy begin to generate broader gains in participation, capability-building, and system-wide absorptive capacity.

From a dynamic perspective, these growth rates imply that the global digital foundation will likely continue to consolidate throughout the coming decade, reducing access disparities and strengthening the enabling conditions for participation in digitally mediated economic activity. In contrast, the slower 3–4% annual growth observed in Digital Technology Entrepreneurship (DTE) points to a structural bottleneck in the translation of digital readiness into entrepreneurial outcomes. This interpretation is consistent with existing evidence that entrepreneurial ecosystems tend to evolve more gradually due to institutional constraints, uneven access to venture finance, regulatory frictions, and limitations in innovation readiness (OECD, 2021; UNCTAD, 2022). From a projection standpoint, such modest growth suggests that without targeted interventions to improve startup support, innovation policy, and regional entrepreneurial networks, DTE will continue to expand at a slower pace than the other pillars.

Taken together, the percentage changes indicate that while the global digital landscape is on a clear upward trajectory, the entrepreneurial dimension of the DEE remains the principal constraint shaping its long-term evolution. This underscores the need for strategic policy attention to ensure that gains in infrastructure, user capabilities, and platform development are matched by comparable advances in entrepreneurial agency.

3 Conclusion and discussion

The DEE index redefines digital entrepreneurship not merely as a by-product of technological advancement but as a systemic phenomenon shaped by multi-agent interactions and dynamic feedback loops across digital and entrepreneurial domains.

This report introduces and elaborates on the Digital Entrepreneurship Ecosystem (DEE) Index, a novel, multidimensional composite indicator that bridges digital infrastructure, user activity, institutional frameworks, and entrepreneurial agency to comprehensively assess the dynamics of digital entrepreneurship. Grounded in a robust theoretical framework, the DEE Index addresses a critical gap in both measurement and understanding by integrating the systemic nature of entrepreneurship with the transformative effects of digital technologies.

In contrast to existing indicators such as DESI, GII, or NRI, the DEE Index provides a more holistic, theoretically embedded, and globally scalable tool. It captures both the input and output sides of digital entrepreneurship, accommodating the roles of various agents and their interactions over time. As digitalization continues to reshape entrepreneurship in unpredictable ways, the DEE Index offers a much-needed compass to guide empirical analysis, comparative evaluation, and evidence-based policy design.

The DEE Index builds on and extends the foundational concepts of Sussan and Acs (2017), Song (2019), and Autio et al. (2018), offering a dynamic, six-level architecture encompassing four sub-indices and twelve pillars. These components jointly capture the interplay between digital ecosystems (comprising infrastructure and users) and entrepreneurial ecosystems (comprising institutions and agents), thereby highlighting the role of digital platforms, user participation, and systemic value creation. Notably, the index introduces a refined classification of agents, distinguishing between users, general agents, and entrepreneurial agents, which helps clarify the pathways through which digitalization drives entrepreneurship.

The methodology of the DEE Index is carefully calibrated to reflect the systemic characteristics of ecosystems. It applies a pooled dataset spanning 170 countries over six years (2017–2022), employs dual standardization methods to balance scale and comparability, and incorporates a penalty for bottleneck (PFB) approach to highlight the constraining effects of weak ecosystem components. This approach aligns with the systemic logic proposed by Acs et al. (2014) and is designed to identify not only levels of development but also inefficiencies and imbalances within national ecosystems.

The DEE Index also demonstrates its value for policymaking. By identifying systemic bottlenecks, the index enables resource optimization strategies that are tailored to specific country-level deficiencies. It enables nuanced benchmarking not only within peer groups but also across various development trajectories. Furthermore, by disaggregating the ecosystem into its structural and functional dimensions—such as digital absorption, startups, scaleups, infrastructure, privacy, rights, finance, and more—it enables policymakers to develop more targeted interventions that are aligned with the systemic interdependencies of the digital entrepreneurial landscape.

Crucially, Part 2 of this study applies the DEE Index in a comparative global context, demonstrating its practical utility. The analysis identifies several digital ecosystem configurations and development levels, highlighting the divergent paths countries take in achieving digital entrepreneurial performance. This application shows that advanced digital infrastructure and skilled users, while necessary, are not sufficient conditions for digital entrepreneurial dynamism. Entrepreneurial agency—especially the presence of financiers, key employees, and support organizations—is often the missing link that transforms digital capability into innovative output and scalable startups.

In conclusion, the DEE Index is more than a measurement tool—it is a conceptual and analytical framework that sheds light on the processes, institutions, and interactions that drive or hinder digital entrepreneurial outcomes. Future research may expand the index by integrating new data sources, incorporating qualitative insights, or exploring regional and sectoral variants. Its theoretical grounding, methodological rigor, and practical utility position it as a significant contribution to both entrepreneurship studies and digital transformation research.

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