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Evaluating the entrepreneurial profile of Vietnam using the digital entrepreneurship ecosystem index

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ABSTRACT

Objective: This study aims to evaluate the performance of Vietnam's digital entrepreneurship ecosystem and provide policy recommendations to improve its performance.

Research Design & Methods: The study used the digital entrepreneurship ecosystem (DEE) index to evaluate the ecosystem performance and the penalty for the bottleneck method to provide policy suggestions. The study used data collected by a project of the University of Pécs including 115 countries for the period from 2019 to 2021.

Findings: The results show that although Vietnam's digital entrepreneurship ecosystem performance is better than its economic development level and has improved over time, its ecosystem is considerably unbalanced. The country has relatively strong and comprehensive legal frameworks to support access and usage of digital infrastructures and to ensure cybersecurity in the digital space. However, it has the biggest problem in granting sufficient freedom to develop digital infrastructures and advancing financial services to facilitate and accommodate digital transactions and activities.

Implications & Recommendations: The study suggests that strengthening the digital freedom and financial facilitation pillar would lead to the greatest improvement in Vietnam's ecosystem performance.

Contribution & Value Added: The study provides additional evidence for the entrepreneurship paradox and data-driven policy recommendations for policymakers to facilitate productive entrepreneurship in Vietnam.

Article type: research article

Keywords: digital entrepreneurship ecosystem; penalty for bottleneck method; Vietnam; entrepreneurship paradox; digital entrepreneurship; policy suggestions

JEL codes: L26, H11

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INTRODUCTION

The relationship between entrepreneurship and economic growth is rather complicated. Although entrepreneurship can enhance economic growth by creating new employment opportunities, the increment in self-employment associated with entrepreneurship can reduce the creation of big firms, thereby slowing down economic growth. High wages associated with economic growth can provide people with resources to start a business, but they can also reduce their incentive to pursue self-employment (Acs, 2006; Liñán & Fernandez-Serrano, 2014). Digital technologies have a significant impact on economies and entrepreneurship (Paul *et al*., 2023; Acs *et al*., 2021). They not only foster innovation and shorten the entrepreneurial process (Sahut *et al*., 2021) but also transform the way entrepreneurs capture and create value (Paul *et al*., 2023; Lopes *et al*., 2025). In the digital economy, entrepreneurs or particularly platform owners, are responsible for building and sustaining the entrepreneurial ecosystem (Stam, 2015) through their own strategies and practices (Nambisan *et al*., 2019). Although various studies with different indices have indicated factors influencing entrepreneurship, the impacts of digital technologies on entrepreneurship remain underexplored (Autio *et al*., 2024).

Vietnam is not only one of the fastest-growing countries in Southeast Asia but also one of the first countries in the world to release a national digital transformation plan (Hung *et al*., 2024). The number of start-ups has increased significantly since 2014, despite the increment in costs of starting up a business (World Bank, 2024) and the lack of economic and political freedom in the country (Audretsch & Fiedler, 2022). This paradox makes Vietnam a compelling country context for studying entrepreneurship. However, the number of studies exploring digital entrepreneurship in Vietnam remains limited.

Considering the above gaps, by using the digital entrepreneurship ecosystem (DEE) index and the penalty for bottleneck method, I conducted an exploratory study to evaluate contextual factors that shape digital entrepreneurship and then provide policymakers with resource allocation recommendations to improve the performance of the digital entrepreneurship ecosystem in Vietnam. The study provides additional evidence of the entrepreneurship paradox and enhances the necessity of contextualising the understanding of entrepreneurship. It also reveals the evolution of Vietnam's digital entrepreneurship ecosystem over time and bridges the gap between academia and practitioners in fostering productive digital entrepreneurship by providing data-driven policy recommendations.

The study begins with a brief definition of concepts that are the basics for developing a digital entrepreneurship ecosystem framework. It then presents the methodology and a discussion of Vietnam's performance across the different dimensions of the ecosystem index. The study concludes with a policy simulation and some suggestions for future research.

LITERATURE REVIEW

Digital Ecosystem

We may define digital technologies through three distinct but related elements, *i.e.*, digital artifacts , digital platforms, and digital infrastructures (Nambisan, 2017). Digital artifacts are objects editable by changing or rearranging their items and contents and are interactive with users or other digital objects to activate expected functionality (Kallinikos *et al*., 2013), such as apps, hardware, or software (Nambisan, 2017). Digital platforms are software-based systems that provide shared service or functionality for complementary software that interoperates with them (Tiwana *et al*., 2010), such as Apple iOS (Nambisan, 2017). Digital infrastructures are 'digital technology tools and systems that provide communication, collaboration, and/or computing capabilities such as cloud computing, data analytics, online communities, social media, or 3D printing' (Nambisan, 2017, p. 1032).

The advancement of digital technologies supported by the proliferation of the internet facilitates the development of an open, complex and interdependent socio-technical environment in which multiple entities, such as individuals, organisations, software, or applications, produce heterogeneous interactions and data. Therefore, the concept of digital ecosystem emerged to address challenges provided by this phenomenon in a scalable and efficient way (Li *et al*., 2012). Different perspectives define the concept differently. In an effort to provide a comprehensive but easy to understand definition, Li *et al*. (2012) combined three perspectives (ecology, economy, and technology) and defined digital ecosystem as 'a self-organizing, scalable and sustainable system composed of heterogeneous digital entities and their interrelations focusing on interactions among entities to increase system utility, gain benefits, and promote information sharing, inner and inter cooperation and system innovation' (p. 119).

Entrepreneurial Ecosystem

The entrepreneurial ecosystem generally refers to 'a set of interdependent actors and factors coordinated in such a way that they enable productive entrepreneurship' (Stam, 2015, p. 1765). The concept has emerged from the common acknowledgement that the economic benefits of entrepreneurship are conditional on contextual settings in which it occurs (Lafuente *et al*., 2022; Song, 2019). It not only treats entrepreneurship as both output and input of the ecosystem but also emphasises the leading role of entrepreneurs in creating and maintaining the healthy ecosystem (Stam, 2015). For policymakers and academia, it is a promising approach to facilitate productive entrepreneurship (Candeias & Sarkar, 2024). Various studies have indicated elements of the ecosystem and explained their connections (Lafuente *et al*., 2022). However, the role of digital technologies in the ecosystem has received

only limited attention (Song, 2019). Moreover, although actors of one entrepreneurial ecosystem can get resources from another ecosystem, current literature has largely ignored the interaction between different ecosystems (Leendertse *et al*., 2025).

Digital Entrepreneurial Ecosystem

Integrating digital ecosystem and entrepreneurial ecosystem literature, scholars conceptualise the digital entrepreneurship ecosystem in different ways. Du *et al*. (2018, p. 1159) defined digital entrepreneurship ecosystem as 'the combination of social, political, economic and cultural elements within a region that supports the development and growth of innovative start-ups pursuing new venture opportunities presented by digital technologies.' Elia *et al*. (2020) consider it as a collective intelligence system or a self-organising community of interdependent entrepreneurial agents that can capture technology-driven opportunities by leveraging the existing digital technologies to facilitate actions and interactions throughout entrepreneurial processes. Although these definitions include the effect of digital technologies on entrepreneurship or consider the role of entrepreneurs in the ecosystem, they do not explicitly capture the role of users in the digital community. Sussan and Acs (2017) addressed this shortcoming and defined digital entrepreneurship ecosystem as 'the matching of digital customers (users and agents) on platforms in digital space through the creative use of digital ecosystem governance and business ecosystem management to create a matchmaker value and social utility by reducing transactions cost' (p. 63).

RESEARCH METHODOLOGY

Sample Data

The University of Pécs collected the data for 115 countries from 2019 to 2021. This study got permission to use it for analysis, so there are no ethical concerns.

Country Background

Development Level

Vietnam's economy has significantly transformed from one of the poorest countries to a low-middle-income country since its economic reform in 1986 (World Bank, 2024). Between 2015 and 2021, Vietnam's annual GDP growth rate was consistently and significantly higher than the average of the world and the income group. However, due to the moderation of domestic demands and challenging external markets, the rate dropped sharply from 8% in 2022 to 5% in 2023 (World Bank, 2024). Vietnam has also experienced a considerably low unemployment rate (around 1.2% to 2.4%) compared to high-income countries (around 4.5% to 6.6%) since 2015. Although the country has slow changes in its human capital (increasing from 0.66 in 2010 to 0.69 in 2020), it is still considered to be better than other low-middle-income countries on average (World Bank, 2020). With a population of 100 352 192, a literacy rate of 96% among adults aged 15 years and over, and a GDP per capita (current US dollar) of 4 282.09 as of 2023, the country remains in the top three most innovative countries in its income group since 2019 (GII, 2024).

Digitalization Level

Vietnam has good initial conditions for digitalisation. In terms of general infrastructure, 100% of the population has access to electricity, and 80% has access to the internet (World Bank, 2024), with international bandwidth ranked 10th in the Network Readiness Index (NRI) 2022. In terms of institutions, Vietnam has relatively comprehensive legal frameworks that cover electronic transactions, consumer protection, privacy and data protection, and cybercrime (NRI, 2022; EGDI, 2022). Despite these favourable initial conditions, the digital transformation level in the economy is still low. Only 2.2% of 1000 surveyed companies reported successful applications of digital tools for automation and data analytics (Ministry of Planning and Investment, 2022). The number of bank account owners among adults remained unchanged during the period from 2014 to 2017 (World Bank, 2019a). Vietnam is also experiencing a high digital divide between the rich and poor, between rural and urban, and among genders (NRI, 2024). Digital skill level falls below the world median with an average annual growth rate of 2.43% from 2017 to 2019 (World Bank, 2019b). While tele-

communication networks and service providers report unwillingness to acquire and upgrade their assets (NRI, 2022), businesses express low interest in investing in AI systems (NRI, 2024).

Digital Entrepreneurship

Despite the prevalence of the gig economy and strong government promotion to invest in emerging technologies (NRI, 2024), the digital entrepreneurship level in Vietnam remains low. The country belonged to the laggard group in the Asian index for digital entrepreneurship system 2021 (Autio *et al*., 2021). Digitally enabled service trade in Vietnam is among the lowest in the Southeast Asia region (World Bank, 2019a). Only 30% of small and medium-sized enterprises deploy digital technologies to manage their internal processes (World Bank, 2019a). Particularly, a very limited number of firms have their own website (NRI, 2024). Moreover, only 20% of the market share of data centres and clouds is locally owned (VCCI, 2022). Key fintech segments, including payment and lending, are still in a nascent stage (World Bank, 2019a).

This low digital entrepreneurship level, to some extent, can be influenced by a high necessity entrepreneurship level, a low risk acceptance attitude, low start-up skills and a high corruption level in the country. Benzing *et al*. (2015) indicated that the three most important reasons for some Vietnamese people to start a business are 'to create a job for myself,' 'to be my own boss,' and 'to increase my income.' They selected entrepreneurship as a career because jobs are often obtained through personal connections, political influence, and money. On the scale of 0-1, the scores of risk acceptance and start-up skills measured by GEI (2019) for Vietnam are just 0.076 and 0.25.

Digital Entrepreneurship Ecosystem Index Structure

Szerb *et al*. (2022) developed the index based on Sussan and Acs (2017) and Song (2019), consisting of four sub-indices: digital user citizenship (DUC), digital technology infrastructure (DTI), digital multi-sided platform (DMSP), and digital technology entrepreneurship (DTE). DUC includes both consumers (demand-side users), such as Uber drivers or smartphone users, and producers (supply-side users) that provide goods or services on the platform, such as Airbnb hosts or advertisers (Acs *et al*., 2021). This sub-index measures the ability of users to participate in digital society and the existence of legal frameworks and social norms that facilitate their access and usage of digital infrastructures (Sussan & Acs, 2017). DTI, including technological and institutional components, measures the degree to which digital infrastructures ensure security, freedom and openness of digital transactions and activities (Song, 2019). DMSPs are demand-side-driven digital intermediaries that enable, organise, and orchestrate social and economic activities and interactions between users and agents (Song, 2019). This sub-index captures the externality of digital platforms on users and agents, and conditions that facilitate financial transactions on platforms. Finally, DTE refers to 'all agents that contribute to experimentation, entrepreneurial innovation, and value creation on platforms' (Song, 2019, p. 577). This sub-index reflects capabilities to use technologies, identify technology-driven opportunities and apply external knowledge or emerging technologies to create value or new business models. Each sub-index has three pillars, of which each is measured through two variables. Pillars are the most important constituents of the index (Acs *et al*., 2019b) (see Annexe 1 for details of pillars and variables).

Penalty for the Bottleneck Method

The theory of the weakest link and the theory of constraints inform the penalty for bottleneck (PfB) method. These two theories imply that the performance of any dynamic (eco)system configured by independent components and feedback loops can improve only when the weakest link or bottleneck is strengthened (Acs *et al*., 2014). The study used this method to suggest areas for government intervention because, unlike traditional index methods, it allows for interaction and partial replacement between components of the (eco)system, thereby portraying a more realistic picture of systematic phenomena (Acs *et al*., 2014). For policy simulation, this method assumes the same costs needed for the performance improvement of each component and the same interaction strength between any two components. This method identifies the bottleneck or the lowest score component of the ecosystem and then increases its value to the second lowest component by the function (1)

(Acs *et al*., 2014). The penalty process for the low score components continues until the ecosystem reaches a balanced configuration or expected performance level.

$$\mathrm{h}_{(i),j} = \min y_{(i),j} + (1 - e^{-(y_{(i),j})-\min y_{(i),j}}) \quad (1)$$

in which $h_{(i),j}$ is the modified, post-penalty value of index component *j* in country *i*, $y_{(i),j}$ is the normalised value of index component *j* in country *i,* and min (y) is the lowest value of $y_{(i),j}$ for country i. (i = 1, 2, . . ., n = the number of countries, j = 1, 2, . . ., m = the number of index components).

Statistical Coherency and Robustness Check

Correlations between pillars ranged from 0.57 to 0.93, while correlations between pillars, sub-indices and overall index were greater than 0.7. This demonstrates the high reliability of the index structure. Moreover, the original DEE index scores performed similarly to the scores produced by three different weighting methods (arithmetic mean, geometric mean, and a combination of arithmetic and geometric mean). This suggests that the original DEE index scores can be free of distortions (see Supplementary material for details).

RESULTS AND DISCUSSION

This section will provide a basic analysis of the digital entrepreneurship ecosystem of Vietnam in comparison with other countries in the index and particularly with Thailand and Cambodia for more comprehensive insights. I selected Thailand and Cambodia for their high similarity to Vietnam in terms of demographics, culture, politics, infrastructure, and geography, as assessed by objectivelist.com.

Vietnam's DEE Rank and Sub-index Analysis

With a DEE score of 27 in 2021, Vietnam is ranked at 80 out of 115 countries, which is 24 places higher than Cambodia but 19 places lower than Thailand (see Annexe 2 for DEE scores and ranks of all countries). The DEE Index score lying above the trend line of the scatter plot (Figure 1) suggests that the digital entrepreneurship ecosystem performance of Vietnam is better than its development level.

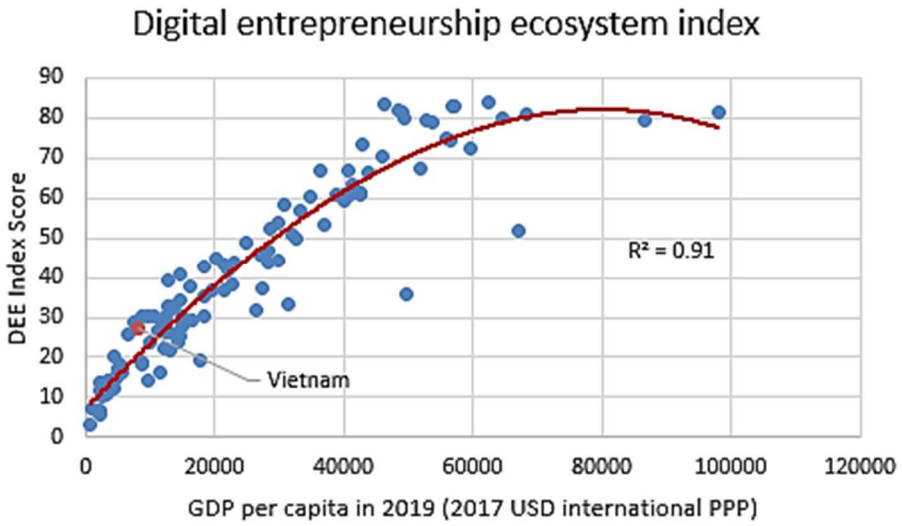

Figure 1. Connection between the DEE index score and GDP per capita
Source: own elaboration.

Among the four sub-indices of Vietnam, DTI had the lowest score (24.65), while DUC had the highest score (30.34). Similar to Figure 1, Figure 2 indicates that three sub-indices (DUC, DMSP, and DTE) performed slightly above the development level, while DTI performance was just in line with the development level.

Vietnam's DEE performance gradually improved between 2019 and 2021 (Figure 3). This improvement seems to be driven most by DUC and least by DTE. Despite being the lowest sub-index

in 2019, the DUC score increased significantly by 13.2 points to become the highest subindex in 2021. In contrast, the DTE score went up by only 1.8 points, making it the second lowest sub-index in 2021 from the strongest sub-index in 2019. Significant changes in the DUC score reflect greater ability of the population to participate in digital society, which can result from strong government promotion and greater coverage of the internet in Vietnam (World Bank, 2019a). In contrast, low improvements in the DTE score indicated slow changes in the capabilities of agents to capture and exploit digital technologies to facilitate entrepreneurial processes and outcomes. We may attribute this to low digital and start-up skills (GEI, 2019) as well as an IT professional shortage in Vietnam. The annual report by the Ministry of Planning and Investment (2022) shows that the IT department of 43.7% of the surveyed enterprises has less than 3 personnel.

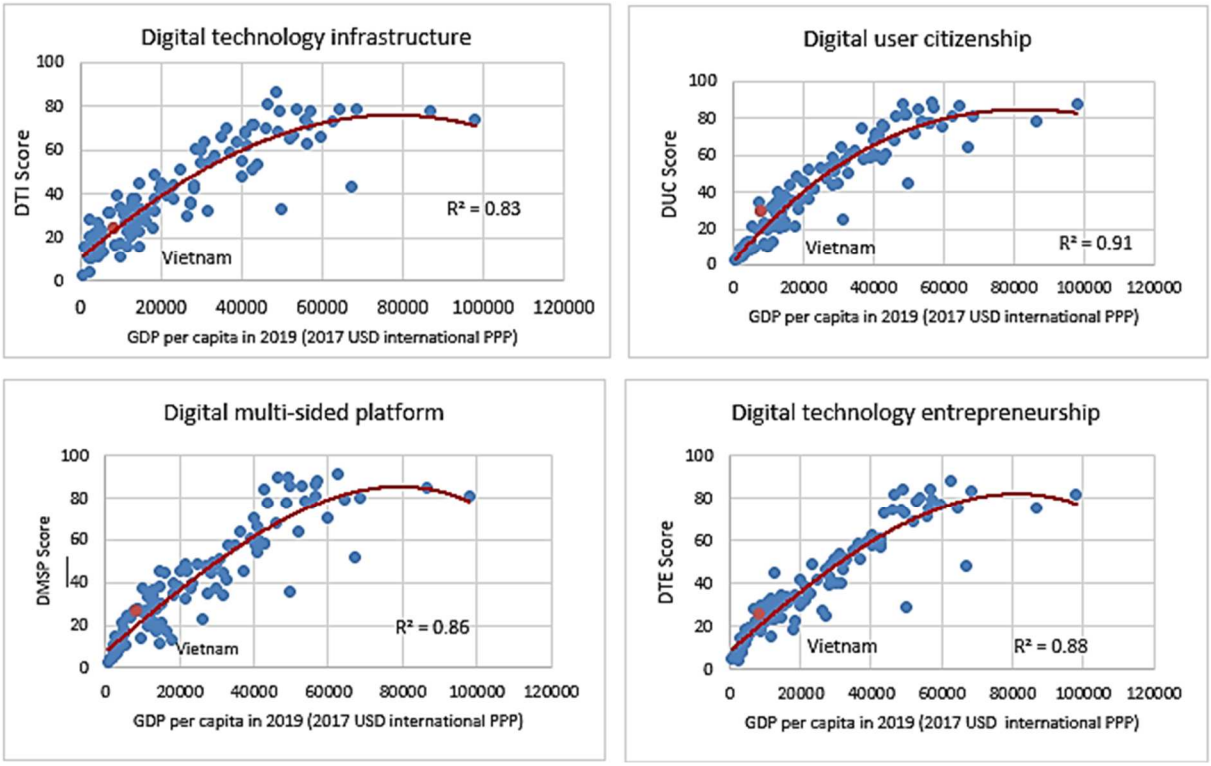

Figure 2. Connection between the score of each sub-index and GDP per capita
Source: own elaboration.

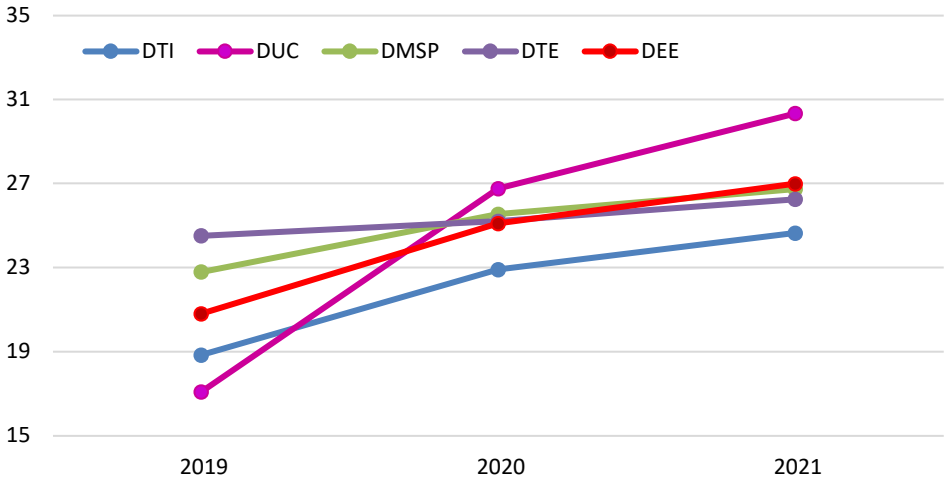

Figure 3. Score of DEE and sub-index of Vietnam from 2019 to 2021
Source: own elaboration.

Pillar Analysis

Figure 4 shows that the ecosystem in Vietnam is considerably unbalanced, with a significant disparity between pillars. The strongest pillar differed from the weakest one by 38.2 points, whereas the difference between the two weakest pillars reached nine points. Compared to the bottom one-third countries, Vietnam performs worse in digital access, digital freedom, digital literacy, digital rights, financial facilitation and digital technology usage pillars and better in digital protection, digital openness, networking, matchmaking, digital adoption and digital absorption pillars.

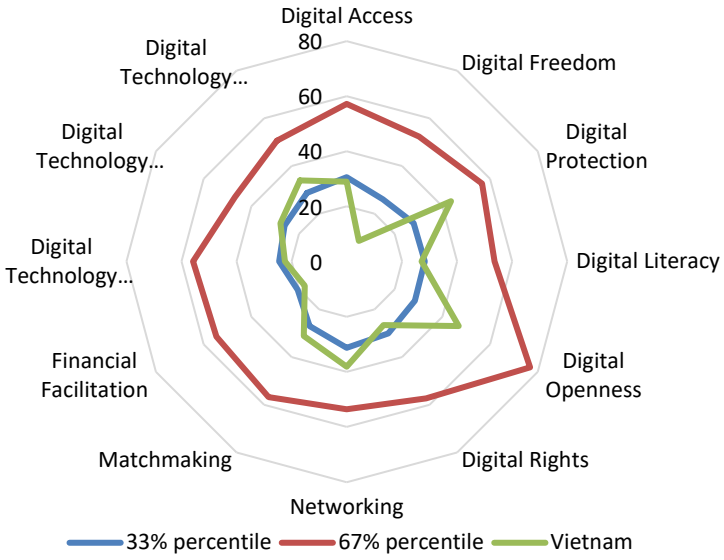

Figure 4. Pillar scores of Vietnam in 2021
Source: own elaboration.

Compared to two neighbouring countries (Figure 5), Vietnam's ecosystem performs better and more balanced than Cambodia, but worse and less balanced than Thailand. Vietnam significantly outperforms Cambodia in all pillars (with an average of 17 points difference) except the digital freedom pillar, where the two countries get the same performance. However, the country is relatively less developed than Thailand in the majority of pillars, except for the digital protection and digital openness pillars.

Digital freedom

With a score of only 8.7, digital freedom is the weakest pillar of Vietnam's digital entrepreneurship ecosystem. This score indicates that the government and other institutions in Vietnam do not provide enough freedom for digital infrastructure development. From a technical aspect, it seems to be difficult for small and medium-sized enterprises to compete in the growing ICT industry in Vietnam. The software market is dominated by foreign companies from the U.S, Germany, or China, whereas three state-owned companies (Viettel, Vinaphone and Mobifone) dominate the broadband or mobile service market (International Trade Administration, 2022). The country also scores low in the dimension of permitting and promoting private sector development in NRI 2022. From a digital content aspect, there is strong internet censorship in Vietnam. According to freedomhouse.org, it is difficult for people to express their personal views on political issues or other sensitive topics. The authority pressures social media platforms and technology companies to remove content that they consider harmful, wrongful, and illegal. For example, in 2020, the authority blocked 3 400 overseas-hosted websites that 'published toxic and harmful information' (Freedom House, 2021). In the first six months of 2022, authorities requested Facebook to remove and block more than 1 374 posts, while Google had to remove 5 363 videos on YouTube (Hung Quan, 2022). The same digital freedom issue pertains to Cambodia and Thailand. However, Thailand offers more business freedom in ICT industry than Vietnam and Cambodia (Mordor Intelligence, 2023).

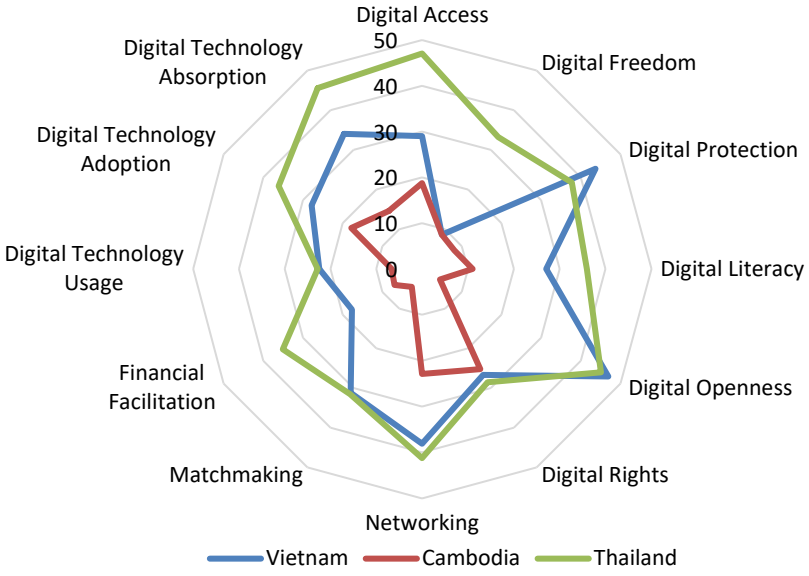

Figure 5. The pillar scores of Vietnam, Thailand, and Cambodia in 2021
Source: own elaboration.

Digital protection

Public announcements and strong pressures on blocking and removing false, harmful, or illegal content in the digital space somewhat reflect the existence of strong legal frameworks that ensure security for online transactions and activities in Vietnam. This explains why digital protection with a score of 43.7 is the second strongest pillar in Vietnam's ecosystem. From an institutional aspect, Vietnam has three major laws covering the digital sphere, *i.e.*, Law on Cyber Information Security (2015), Cybersecurity Law (2018), and Law on e-transactions (2001). The country also has a dedicated unit under the Economic Police Department to deal with cybercrime. From a digital technology aspect, the total number of secure internet servers per million of the population in Vietnam increased by 19.59% to 3 128 in 2020 from 2019, which is almost double that of Thailand and far ahead of Cambodia (World Bank, 2024). The government even requested state organisations to utilise at least 10% of their total IT expenditure on improving cybersecurity solutions and initiatives (International Trade Administration, 2022). Therefore, it is no surprise that Vietnam ranked 25th, 19 places higher than Thailand and 108 places higher than Cambodia in the Global Cybersecurity Index 2020 (ITU, 2020).

Digital access

Vietnam scores slightly below the bottom 33% of countries in the DEE index. Thailand performs better than Vietnam with an 18-point difference, and Vietnam outperforms Cambodia by 10.2 points. This low pillar score can represent an institutional constraint between protection and freedom to reach and use digital infrastructures in Vietnam, and may result from its culture and underdeveloped digital infrastructures. Gender based stereotypes and concern about online safety may prevent women from accessing and participating in the digital society in Vietnam, making it among the few countries with gender parity on internet access (UNICEF, 2023). Compared to Thailand, Vietnam and Cambodia have poorer connectivity infrastructure. As of 2018, around 58% of the Thai population is covered by a 3G network, while it is only 41% for Vietnam and 40% for Cambodia (World Bank, 2019a). Moreover, while Thailand belonged to the top 5 countries in the Speedtest Global Index November 2023 for fixed broadband download, Vietnam ranked far below at the 46th position.

Digital literacy

With a score of 27.1, the digital literacy of Vietnam is slightly lower than the bottom one-third of countries in the index, but remarkably above that of Cambodia. Despite the government's promotion and

participation in digital transformation (EGDI, 2022) as well as commitment to closing the digital skill gaps, which is stronger than in Thailand and Cambodia (DSGI, 2021), the ability to use digital technologies in Vietnam remains low, as mentioned previously. Low digital literacy can contribute to and be influenced by the low digital access level. A lower chance of accessing and participating in digital society may prevent women from enhancing their digital skills. Vietnam is among the few countries with gender parity in digital skills (UNICEF, 2023).

Digital Openness

This is the strongest pillar of Vietnam's DEE index. The country even slightly outperforms Thailand in this dimension. This result comes with a bit of surprise, as Vietnam has a lower rate of internet access among its population (74.21%) than Thailand (85.3%) (World Bank, 2024) and only a slightly higher percentage of households with a computer at home (27.1%) than Thailand (25.8%) in 2021 (World Bank, 2023). Apart from better availability of technical and legal institutions related to cybersecurity, the provision of both mobile broadband and fixed-line broadband at much cheaper prices can be a factor that boosts Vietnam's digital openness level to be higher than that of Thailand (World Bank, 2019a).

Digital Rights

With a score of 26.7, Vietnam's performance in digital rights is moderately below Thailand and the bottom 33% of countries. This reflects that although Vietnamese citizens have the right to access and use the internet and digital technologies, and the government provides various legal frameworks to protect their privacy in digital space (which ranks high at other indices such as EGDI), the effectiveness of these frameworks is debatable. While Thailand ranks at 75th out of 131, Vietnam ranks 46 places lower in terms of perceived privacy protection by law content in NRI 2022. This low perceived effectiveness of legal frameworks can partly result from their ambiguity on violations related to intellectual property rights on the internet and from their failure to cover some important aspects, such as copyright during the delivery stage (Nguyen, 2022).

Networking

This pillar reflects the extent to which users can capture the externality effect of digital platforms. Vietnam's performance in this pillar is better than that of the bottom one-third of countries, but slightly worse than Thailand. For example, social media becomes an attractive platform for supply-side users to conduct business activities in both Thailand and Vietnam, as both nations are among those with the highest social media usage rate in the world (37% for Vietnam and 56% for Thailand). 74% of supply-side users in Thailand and 73% in Vietnam utilised social media and messaging platforms for commercial purposes such as customer communication or advertising campaigns (World Bank, 2019a).

Matchmaking

Having almost the same score for this pillar indicates that the effectiveness of using digital platforms to connect buyers and sellers at low costs is nearly equal in Vietnam and Thailand. For example, the digital advertising market is growing rapidly in both countries (projected 11% for Vietnam and 9.8% for Thailand in 2023). The number of apps downloaded is estimated to reach 2 743 million for Thailand and 3 031 million for Vietnam. Shopping is a segment that brings the highest average revenue per downloaded app for both countries as of 2023 (Statista, 2023a). Real-time records from Similarweb show that as of February 2025, local developers develop 33% of top mobile apps in Vietnam, whereas the figure is 20% for Thailand (Similarweb, 2025). Both nations perform better than the bottom one-third of countries and leave Cambodia far behind in this pillar.

Financial Facilitation

Vietnam's digital financial infrastructure and service that facilitates matchmaking between financial providers and users or other transactions in digital platforms is the second weakest pillar of Vietnam's ecosystem and far less developed than Thailand. From the user side, Vietnam is considered one of Asia's most cash-reliant nations (Acclime, 2023a). In Vietnam, people pay for 90% of internet purchases

by cash as of 2017, and digital payment accounts for only 22% of total payments as of 2018, while these figures are 48% and 62% in Thailand, respectively (World Bank, 2019a). We may attribute the low level of digital payments in Vietnam to a low number of people owning bank accounts or equivalents and a low level of customer trust. As of 2022, only 56.27% of the Vietnamese population has an account at a financial institution or mobile money service, while the figure is 95.58% for Thailand (World Bank, 2024). From the agent side, Vietnam suffers from a shortage of skilled human resources in fintech. People who are knowledgeable about finance and banking lack information technology and foreign language skills. Key fintech segments, such as the peer-to-peer lending market, are still new in Vietnam, and specific governance rules for these segments are not available yet. In contrast, digital finance services are growing fast in Thailand. The Thai government strongly promotes financial innovation and investment in the electric banking and fintech sector while enhancing infrastructure to accommodate those advancements (Acclime, 2023b).

Digital Technology Usage

The pillar score reflects that entrepreneurial agents in Vietnam and Thailand have almost the same level of basic digital capabilities. Both countries perform significantly better than Cambodia, but slightly below the bottom one-third of countries, despite their strength in international internet bandwidth. The low digital capabilities level can result from a lack of formal training provided by firms in these three countries (ranked at the bottom 33% of countries in GII 2022), while explaining a low level of digital transformation commonly found in Southeast Asian countries by the World Bank (2019a). Technicians and associate professionals also constitute only a small portion of the workforce in the three countries (ranked in the group of the bottom 40 countries in NRI 2021).

Digital Technology Adoption

Although the level of digital technology usage is almost the same in Vietnam and Thailand, Thai agents are actually better at exploiting benefits or opportunities provided by digital technologies to build new business models or new products/services than their Vietnamese counterparts. Compared to Thailand, Vietnamese firms rely more on software purchases or licenses from outsiders than on their own internal software development (GII, 2022). According to the World Bank (2019a), 10% of surveyed firms in Vietnam used technologies licensed from foreign companies, while it was only 5% for Thailand. After COVID-19, in 2021, service for network infrastructure, servers, and storage bounced back more quickly in Thailand, while Vietnam displayed the opposite trend (Statista, 2023b).

Digital Technology Absorption

With a score of 34.1, Vietnam's digital technology absorption (level of knowledge spillover when exploring or experimenting with emerging digital technologies) is higher than the bottom 33% of countries but significantly lower than Thailand. From the agent side, a higher influx of outside technologies and services provides Thai firms a better chance to be exposed to new technologies. Thailand's ICT service import accounts for 0.4 % of total trade, which is 0.3 % higher than that of Vietnam. Moreover, a high number of research talents in business in Thailand (60.8%), which is almost triple that of Vietnam, allows Thai firms to learn from imported services much more readily than in Vietnam (GII, 2022). Apart from a low number of research talents in business, collaboration between the university and industry in R&D is not strong enough to support knowledge spillover in Vietnam. From a digital technology aspect, while local firms dominate the data centre market in Thailand, the opposite is true for Vietnam (Mordor Intelligence, 2023).

Policy Simulation

Without losing any generality, the study runs policy simulations for a scenario of increasing the DEE index score by 10% for Vietnam by using the PfB method. Table 1 suggests that a total of 14 additional units of resources are needed to improve the DEE index score by 10%. Of which, 86% should be allocated to improve institutional frameworks so that citizens can have greater freedom in contributing to the development of digital infrastructures, and 14% should serve to improve digital

financial infrastructures and services to encourage and facilitate more transactions and activities in the digital space. Because the difference between the strongest and the lowest pillar, as well as the difference between the two weakest pillars, is large, it is not surprising that these two bottlenecks consume all of the country's additional effort and resources.

Table 1. Policy simulation

Pillar	Original pillar score	Required increase in pillar (unit/population)	Percentage of total new effort
Digital access	29.0	0	0%
Digital freedom	**8.70**	**12**	**86%**
Digital protection	43.7	0	0%
Digital literacy	27.1	0	0%
Digital openness	46.8	0	0%
Digital rights	26.7	0	0%
Networking	38.1	0	0%
Matchmaking	31.2	0	0%
Financial facilitation	**17.7**	**2**	**14%**
Digital technology usage	22.4	0	0%
Digital technology adoption	27.9	0	0%
Digital technology absorption	34.1	0	0%
Sum of additional resources (unit/population)	–	**14**	–

Source: own study.

CONCLUSIONS

By using the DEE index to evaluate the performance of Vietnam's digital entrepreneurship ecosystem. The study found that although Vietnam's digital entrepreneurship ecosystem performs better than its economic development level, it is highly unbalanced. On the one hand, the country has an impressive performance in promoting individuals and firms to participate in digital society, as well as providing strong and comprehensive legal frameworks to ensure their security and privacy in digital space. On the other hand, it almost fails to ensure sufficient freedom for digital infrastructure development and adequate investment in digital financial services and infrastructures. While we may attribute the lack of digital freedom to strong internet censorship together with the dominance of some major local companies in the mobile and fixed broadband sector, we may explain the underdevelopment of digital finance by the Vietnamese strong culture of cash reliance, a lack of specific governance frameworks, and a shortage of skilled human resources with IT skills in the fintech sector. Overall, although national digital conditions for entrepreneurship gradually improve over time, they are still considered unfavourable. By using the PfB method, the study suggests that country-level governors or policymakers should consider resource allocation for strengthening digital freedom and digital financial services and infrastructures to be a priority if they want to accomplish the greatest improvement in their digital entrepreneurship ecosystem.

The study enriches the current literature on entrepreneurship and enhances the necessity of a contextualised understanding of entrepreneurship by providing additional evidence of a digital entrepreneurship paradox in Vietnam. The study also expands the literature on digital entrepreneurship in Vietnam by revealing an additional perspective for its development potential and the evolution of its national conditions. Practically, the study demonstrates to policymakers and governors how resource allocation for specific bottlenecks can improve their overall national digital entrepreneurship ecosystem. Consequently, they can make more informed decisions to foster digital entrepreneurship, which narrows the gap between academia and practitioners. The findings also remind policymakers and governors of the need to adopt a holistic approach when formulating policy interventions toward productive entrepreneurship. They should not only consider the interconnection, complementarity, and tensions between components of the digital entrepreneurship ecosystem but also involve academia and other social actors in the policy formulation process.

The study has some limitations. Firstly, although the study offers a country-level picture of the digital entrepreneurship ecosystem, it does not explore regional variations within countries. Secondly, although the study considers the interaction between pillars within the ecosystem, it does not consider variations in the strength of these interactions. Thirdly, although the current index reflects multidimensions of the digital entrepreneurship ecosystem, it may suffer a redundancy problem due to very high correlations between sub-indices and the overall index. Therefore, future research can provide a better picture of the digital entrepreneurship ecosystem in Vietnam by using regional-level data and selecting new indicators. Future research can also offer better policy recommendations by involving governors and social actors, exploring low-performance pillars further, or using more sophisticated statistical methods that allow for various interactions between pillars and other contextual constraints.

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Appendix:

Annex 1. **Digital entrepreneurship ecosystem structure**

Digital entrepreneurship ecosystem index			
Sub-indices	Pillars	Variables (entrepreneurship/ digital)	Variable description
Digital technology infrastructure	Digital access	Institutions	ICT and e-commerce regulation
		Digital technology	Population use of G2-G5 networks and radio frequency coverage
	Digital freedom	Institutions	Business, world press, and general freedom
		Digital technology	ICT competition, mobile tariffs, and handset prices
	Digital protection	Institutions	Measuring laws and regulations on cybercrime and cybersecurity
		Digital technology	Secure Internet servers per million population, net infection ratio
Digital user citizenship	Digital literacy	Institutions	Human capital, the promotion of e-participation
		Users	Digital skills among the population
	Digital openness	Institutions	The existence of technical institutions, frameworks, policy coordination institutions, and strategies dealing with cybersecurity
		Users	Percentage of households with a computer and internet access
	Digital rights	Institutions	Regulatory quality, personal rights, fundamental rights and property rights
		Users	Percentage of individuals using the internet,
Digital multi-sided platform	Networking	Agents	Number of professional developers
		Users	Social media use
	Matchmaking	Agents	Mobile apps developed per person, number of apps in the national language
		Users	Accessibility of the top-ranked apps
	Financial facilitation	Agents	Risk attitudes, the number of financial technology businesses
		Users	The usage of digital financial solutions, including credit cards, mobile phones, the internet, and digital payment
Digital technology entrepreneurship	Digital technology usage	Agents	Technicians and associate professionals, intermediate education, and firms with a website
		Digital technology	Availability of electricity, internet bandwidth,
	Digital technology adoption	Agents	Professionals and advanced education, adoption of emerging technology
		Digital technology	Generic top-level domains
	Digital technology absorption	Agents	Managers and research talent at business, innovative startups
		Digital technology	Computer software spending, data centres

Source: Szerb *et al*., 2022.

Annex 2. **Digital entrepreneurship ecosystem index, country ranking 2021**

Rank	Country	DEE_2021	Rank	Country	DEE_2021	Rank	Country	DEE_2021
1	United States	**83.8**	40	Chile	**48.6**	78	Bosnia and Herzegovina	**27.7**
2	United Kingdom	**83.5**	41	Malaysia	**46.7**	79	Iran	**27.3**
3	Netherlands	**83.0**	42	Russia	**45.8**	80	Vietnam	**27.0**
4	Denmark	**82.9**	43	Costa Rica	**44.6**	81	Ecuador	**26.8**
5	Finland	**81.9**	44	Romania	**44.4**	82	Paraguay	**26.3**
6	Canada	**81.4**	45	Turkey	**44.0**	83	India	**25.9**
7	Singapore	**81.3**	46	Bulgaria	**43.9**	84	Armenia	**25.8**
8	Switzerland	**80.9**	47	Uruguay	**43.4**	85	Lebanon	**25.0**
9	Norway	**80.1**	48	Serbia	**42.8**	86	Jordan	**23.8**
10	Australia	**79.7**	49	Argentina	**41.8**	87	Azerbaijan	**23.6**
11	Sweden	**79.2**	50	Brazil	**40.6**	88	Mongolia	**22.0**
12	Ireland	**79.2**	51	Qatar	**40.4**	89	Sri Lanka	**21.6**
13	Germany	**79.1**	52	Saudi Arabia	**40.3**	90	Kenya	**20.0**
14	Austria	**75.1**	53	Ukraine	**39.5**	91	Botswana	**19.3**
15	Iceland	**74.3**	54	Mauritius	**38.3**	92	El Salvador	**18.8**
16	New Zealand	**73.2**	55	China	**37.6**	93	Kyrgyzstan	**18.3**
17	Hong Kong	**72.6**	56	Bahrain	**37.6**	94	Guatemala	**18.3**
18	Luxembourg	**71.6**	57	Oman	**37.5**	95	Nigeria	**17.1**
19	France	**70.4**	58	Montenegro	**37.0**	96	Honduras	**16.2**
20	Belgium	**67.5**	59	Mexico	**36.6**	97	Algeria	**16.1**
21	Estonia	**66.9**	60	Kuwait	**35.8**	98	Bangladesh	**15.3**
22	Spain	**66.7**	61	Thailand	**35.5**	99	Pakistan	**14.7**
23	Malta	**66.4**	62	Colombia	**34.4**	100	Namibia	**14.4**
24	Japan	**63.1**	63	Panama	**33.1**	101	Senegal	**14.3**
25	Italy	**61.6**	64	Albania	**32.7**	102	Rwanda	**13.8**
26	Cyprus	**61.1**	65	Peru	**32.6**	103	Nepal	**12.8**
27	Slovenia	**61.0**	66	Kazakhstan	**31.9**	104	Cambodia	**12.0**
28	Korea	**60.8**	67	Moldova	**31.6**	105	Cameroon	**11.6**
29	Czech Republic	**60.6**	68	Tunisia	**30.4**	106	Uganda	**11.6**
30	Portugal	**60.6**	69	Jamaica	**30.1**	107	Zimbabwe	**11.5**
31	Israel	**59.6**	70	South Africa	**30.1**	108	Zambia	**11.0**
32	Latvia	**58.3**	71	Dominican Republic	**30.1**	109	Benin	**10.8**
33	Poland	**56.7**	72	Philippines	**30.0**	110	Tanzania	**10.2**
34	Greece	**53.8**	73	Georgia	**30.0**	111	Malawi	**7.2**
35	Lithuania	**53.5**	74	Macedonia	**29.2**	112	Mali	**6.8**
36	Croatia	**52.6**	75	Morocco	**28.8**	113	Madagascar	**6.6**
37	United Arab Emirates	**52.1**	76	Indonesia	**28.5**	114	Ethiopia	**5.4**
38	Slovakia	**50.8**	77	Egypt	**28.4**	115	Burundi	**3.3**
39	Hungary	**49.6**	–	–	–	–	–	–

Source: own elaboration.

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Use of Artificial Intelligence

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Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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