

BELGIUM DIGITAL ENTREPRENEURSHIP ECOSYSTEM BASED ON THE DIGITAL PLATFORM ECONOMY INDEX 2020

GANSULD DAASHINKHUU¹

ABSTRACT: *The current advancements in information technology enable us to build the global digital platform economy. Szerb et al. (2022) propose the Digital Platform Economy (DPE) Index, which includes four sub-indices and twelve pillars (each with two variables) to estimate the scale of the digital platform economy. This paper considers where Belgium stands regarding its digital entrepreneurship ecosystem, using the DPE Index 2020 as a yardstick. Belgium ranks 17th on the DPE Index 2020, with a score of 62.5, outperforming the EU and high-income nation averages. Furthermore, this research intends to narrowly investigate Belgium's digital entrepreneurship ecosystem using the DPE Index's four sub-indices and twelve pillars and data from other sources to make policy recommendations. It uses both a basic and pillar-based analysis to identify the relative importance of each pillar in the overall composite index and better understand the strengths and limitations of the Belgian digital entrepreneurship ecosystem. It applies quadrant analysis and policy optimisation, which are the foundations for the principal policy recommendation. Belgium's DPE Index performance underscores the need for targeted policies to enhance digital infrastructure, education, and regulatory support. While outperforming the EU average, Belgium trails similar nations in technology adoption and digital literacy. A 5%/10% improvement could drive significant progress, with insights from the Netherlands and Luxembourg aiding competitiveness.*

KEYWORDS: *digital entrepreneurship ecosystem, digital platform economy, Digital Platform Economy Index, digital ecosystem, entrepreneurial ecosystem*

¹ Gansuld Daashinkhuu is a PhD Candidate at the University of Pécs, Faculty of Business and Economics, International PhD Program in Regional Development in Pécs, Hungary; email address: gansuld@gmail.com.

INTRODUCTION

Technological change has played a vital role in long-term economic growth and development, as can be seen in the histories of developed countries since the First Industrial Revolution. Moreover, endogenous growth theory accentuates the contributions of human capital, knowledge, and innovation as the engines of long-run economic growth. Today, we are in the age of the Fourth Industrial Revolution (4IR) and the Information-Technology Revolution (ITR). The 4IR or Industry 4.0 technologies encompass big data, machine learning, cloud computing, blockchain technology, artificial intelligence, digital platforms, 3D printing, and augmented and virtual reality. The Information-Technology Revolution is concerned with digital technology and how information is represented in bits, which helps lower the costs of storing, computing, and transmitting data (Goldfarb–Tucker 2019).

The recent development of information technology has allowed us to construct the global digital platform economy. The term “platform economy,” often known as the “digital platform economy,” refers to an increasing variety of digitalised engagements in business, politics, and social contact. Moreover, the digital platform economy is characterised by online platforms that ease exchanges between users, businesses, and service providers. The platforms serve as intermediaries, enabling transactions across various sectors, such as e-commerce and gig work. Essential features include:

- **Intermediation:** Connecting users and businesses without owning goods (e.g., Uber, Airbnb).
- **Network Effects:** Value increases as user participation grows (e.g., Facebook, eBay).
- **Data-Driven Operations:** Collecting user data for personalised services and engagement.
- **Algorithmic Governance:** Using algorithms to manage supply and demand or pricing (e.g., dynamic fare adjustments associated with ride-hailing).
- **Monetisation Models:** Generating revenue through transaction fees, advertising, subscriptions, and data monetisation.

If the factory was the central organising principle of the industrial revolution, then these digital platforms are the primary organising principle of the current wave of change. We are, in fact, in the midst of an economic restructuring in which the owners of digital platforms appear to be amassing power that might be more formidable than that of factory owners at the outset of the industrial revolution (Kenney–Zysman 2016).

Szerb et al. (2022) constructed the Digital Platform Economy (DPE) Index with four sub-indices and twelve pillars (each one having two variables) in order to calculate the importance of the digital platform economy. We can consider that the DPE Index combines two distinct kinds of literature that apply to digital and entrepreneurial ecosystems. A digital ecosystem is determined by a network of interconnected technologies, businesses, and users cooperating within a digital environment. The key elements of this ecosystem involve digital infrastructure, platforms, data, regulations, and innovation. The ecosystem boosts connectivity, drives economic growth, enables scalability, fosters innovation, and significantly increases efficiency, providing a sense of reassurance and making it essential in digital transformation. The entrepreneurial ecosystem consists of a diverse network encompassing entrepreneurs, investors, supportive organisations, educational institutions, policies, markets, and infrastructure, all aimed at encouraging business growth. It suggests the need for funding, mentorship, talent, and various resources to assist startups in their innovation and scaling efforts. Moreover, the digital entrepreneurship ecosystem is a subset of the broader entrepreneurial ecosystem, concentrating on tech-driven businesses. At the same time, it is delineated by a subset of the digital ecosystem, specifically supporting startups and business creation.

Weill and Woerner (2015) underline the research question, “What steps should firms take to prepare for digital disruption?” They recommend that businesses use digital techniques to learn more about their customers and assist them in meeting their life event needs. Furthermore, organisations that only operate as suppliers will face increasing pressure to build a digital ecosystem and partner with others, including competitors. Digital ecosystems are complex and interconnected systems, as are their underlying infrastructures, in which all participants engage and demonstrate self-organising, scalable, and sustainable behaviours as a whole. Scholars are interested in this growing area. Yet, there are different views and disputes regarding what digital ecosystems are, how they should be constructed, and their implementation (Li et al. 2012). The latter summarise the notion of the digital ecosystem and establish a foundation for a shared understanding. Then, they identify four elements: (1) Advances in Information and Communications Technologies (ICTs); (2) Social networks and virtual communities; (3) Emergence of business networks; and (4) Information Technology (IT)-enabled services. These factors have contributed to the formation of digital ecosystems and help provide definitions, characteristics and classifications for each. In addition, they address models and simulation tools to demonstrate pre-existing successes and constraints, and finally, they highlight critical problems and illuminate future research on digital ecosystems. The idea of an entrepreneurial ecosystem highlights that entrepreneurship

happens within a network of interconnected entities. In this way, the literature on entrepreneurial ecosystems relates to other recent “systems of entrepreneurship” approaches, which attempt to link the innovation system approach and entrepreneurship studies by examining the role of the context in enabling or hindering entrepreneurship (Stam 2015). The entrepreneurial ecosystem approach shares a commonality with other well-established ideas like innovation systems, clusters, industrial districts, and learning regions in that all of these place the emphasis on the external business environment. In contrast to these ideas, the approach focuses on the entrepreneur rather than the business itself. Thus, the entrepreneurial ecosystem approach centres on the entrepreneur rather than the business while stressing the environment’s importance. The recent literature on entrepreneurial ecosystems is primarily intended for the ecosystem’s core players, namely entrepreneurial leaders and policymakers, rather than an academic audience. It addresses practitioners directly, yet its causal depth and evidence foundation are somewhat restricted. Contemporary entrepreneurial ecosystem literature enumerates several factors considered vital for an entrepreneurial ecosystem’s success. For instance, Feld (2012) identifies nine characteristics of a thriving entrepreneurial ecosystem, including high network density, numerous connecting events, and large companies collaborating with local start-ups, as well as access to all relevant resources (talent, services, and capital), and an enabling role for government.

The digital entrepreneurship ecosystem is defined by a network of individuals, technologies, and institutions that support digital business creation and growth. This interconnected system fosters innovation, economic growth, scalability, and job creation and provides resources, mentorship, and investment opportunities for digital startups. By highlighting these benefits, we can better appreciate the importance and potential impact of the digital entrepreneurship ecosystem. Sussan and Acs (2017) argue that there is a big gap in the notion of entrepreneurship in the digital era. They present a conceptual approach for analysing entrepreneurship in the digital age by combining two well-known concepts: digital and entrepreneurial ecosystems. Connecting these two ecosystems allows us to better comprehend the connections of agents and users by incorporating information about consumers’ individual and social behaviour. The approach to the digital entrepreneurial ecosystem is made up of four concepts: digital infrastructure governance, digital user citizenship, digital entrepreneurship, and digital marketplace. Song (2019) reconsiders and extends the framework proposed by Sussan and Acs (2017) via the following reconfigurations:

- Digital User Citizenship is reintroduced as a varied group of users distinguished by their significant activity, either as consumers or producers;

- Digital Technology Entrepreneurship refers to all agents that create complementary products and services that link to platforms;
- A digital multi-sided platform serves as an intermediary for the purchase and sale of goods and services, as well as a means of knowledge exchange, allowing for experimentation, entrepreneurial innovation, and value creation.

The paper's essential contribution is in the reconfigurations that explicitly create the groundwork for a more sustainable digital entrepreneurial ecosystem that protects user privacy and platform security.

In this paper, we consider where Belgium stands in terms of its digital entrepreneurship ecosystem, using the DPE Index 2020 as a yardstick. What is more, this research aims to narrowly investigate the digital entrepreneurship ecosystem of Belgium using the four sub-indices and twelve pillars of the DPE Index and data from other sources, as well as to recommend some policy suggestions. To determine the relative importance of each pillar in the overall composite index and thus to better understand the strengths and weaknesses of the Belgium digital entrepreneurship ecosystem, we conduct both a basic and pillar-based analysis. Furthermore, we compare the position of the DPE Index of Belgium with two neighbours, the Netherlands and Luxembourg, which are the leader and follower in the cluster of the DPE Index 2020, respectively. We choose these countries to contrast Belgium with countries that are socially, economically, and geographically comparable and can be compared in terms of language, culture, and geography, but which have a competitive advantage in socioeconomic and technological innovation, as well as digital and entrepreneurship ecosystems. Finally, we perform a quadrant analysis and policy optimisation, which form the basis for the primary policy suggestion.

The paper is structured in the following way. The next section briefly summarises the fundamental idea and calculation methodology of the DPE Index, which is followed by a section concisely introducing the digital and entrepreneurial ecosystem in Belgium. The subsequent section looks at Belgium's position in the DPE Index 2020, while the fifth section puts forward some policy suggestions. The final section draws conclusions.

BASIC DESCRIPTION OF THE DPE INDEX METHODOLOGY

As more people are using big data, cutting-edge algorithmic techniques, and cloud computing, a digital platform economy based on platform businesses is starting to form around the world. If a country improves its digital ecosystem,

this does not mean that current companies will use it. The use of new technologies by start-ups is similarly unclear due to the entrepreneurial ecosystem. Digital and entrepreneurial ecosystems have to be built up at the same time in order to introduce new technologies successfully. We can measure the importance of the digital platform economy using the DPE Index, proposed by Szerb et al. (2022), which is a multidimensional and composite indicator. This index has four sub-indices and twelve pillars, representing and combining the digital and entrepreneurial ecosystems.

Moreover, the DPE Index helps improve the understanding of multi-sided platforms, platform-based ecosystems (Sussan–Acs 2017), and platform economies. The platform-based ecosystem or digital entrepreneurial ecosystem is extended by Song (2019) into multi-sided platforms. The DPE approach is based on the following four conceptions, which are the sub-indices in terms of the DPE Index (See Figure A1 in *Appendix A*):

- Digital User Citizenship (DUC): This represents the users on the demand and supply sides. Users' privacy must be safeguarded if the DUC is to thrive. The DEE will collapse if the public's confidence in it declines. Engagement and subscription rates tend to drop when users lose faith in a platform.
- Digital Technology Entrepreneurship (DTE): This embodies app developers and agents who try to be partly responsible for value creation and entrepreneurial innovation on platforms. DTE fosters entrepreneurial invention and thus improves platform efficiency. The larger the user population, the more market segments and niches there are. A good platform sponsor provides boundary resources that facilitate the entrepreneurial innovation process as well as a reasonable profit-sharing plan.
- Digital Multi-sided Platforms (DMP): This coordinates user and agent interactions in social and economic activities. The ITR's main organisational innovation is DMP. Saadatmand et al. (2019) emphasise that digital platforms are an emergent corporate form characterised by technology and social processes. However, DMP's monopolistic application will hinder competition, creativity, and entrepreneurship, leading to a loss of welfare for consumers and society.
- Digital Technology Infrastructure (DTI): This is related to all rules and regulations which manage digital technology's technical, social, and economic aspects. DTI is essential to the functioning of the platform economy. The term "digital infrastructure" refers to the systems and regulations that regulate the use of digital technologies in the modern era. The DPE relies heavily on this technical framework to function correctly and ensure the safety and accessibility of the digital economy.

Szerb et al. (2022) accent that the ideas of a digital entrepreneurial ecosystem and a platform-based economy are still reasonably recent compared with digital and entrepreneurial ecosystems. Instead of focusing exclusively on the implementation or utilisation of digital technologies, the DPE Index puts an emphasis on platformisation.

The DPE Index that this research suggests measures the DPE at the national level. The DPE Index structure, including the four frames known as sub-indices, is shown in Table 1. The most crucial elements of DUC, DTE, DMP and DTI are represented by three pillars (see more details about the pillars in *Appendix B*) in each of the four frames. There are two kinds of variables in each pillar: digital and entrepreneurship. Agents and users are examples of pillar variables for networking, while institutions and digital technology are pillar variables for digital protection. More concretely, two to five indicators, which are the foundation of the aggregate indicator, make up the pillar variables. The authors used 61 indicators and based their selection on three criteria (See the full description of each indicator in Szerb et al. (2022) Chapter 3, and the data source and the survey year from the section *The Applied Indicators in the Digital Entrepreneurship Index*, (ibid.)). In addition, they outline six steps for calculating the DPE Index score (for more details, refer to the section *The Calculation of the DPE Index and the Component Scores* in their work). The DPE index score ranges from a minimum of 0 to a maximum of 100.

The DPE Index may involve several limitations and potential biases concerning data collection (1–5) and the weighting of indicators (6–9). These include: (1) Data availability and comparability; (2) Timeliness of data; (3) Over-reliance on quantitative metrics; (4) Sectoral bias; (5) National-level focus; (6) Subjectivity in weighting; (7) Economic bias; (8) Cultural and regulatory differences; and (9) Bias toward western platforms. For example, in terms of (1), the index draws on global datasets, such as those from the World Bank, the International Telecommunication Union, and the World Economic Forum. However, data availability varies, particularly in developing countries, resulting in potential gaps and inconsistencies.

New digital technologies have modified the essence of the inherent uncertainties in entrepreneurial processes and outcomes and how this uncertainty can be managed. This raises substantial questions regarding digital entrepreneurship at the node of digital technologies and entrepreneurship (Nambisan 2017). It focuses on the following two critical questions that arise in the context of entrepreneurship in a digital environment: (1) how does the richness of extensive digitisation, such as its variability, materiality, generativity, and emergence, lead to the necessity for new theorising in entrepreneurship? (2) What components

should be included in the new approach of entrepreneurship that acknowledge and incorporate this richness into their frameworks?

Table 1. Structure of the DPE Index

Sub-indices	Pillars	Variables (entrepreneurship and digital)
Digital User Citizenship (DUC)	Digital literacy	Digital literacy: Institutions Digital literacy: Users
	Digital openness	Digital openness: Institutions Digital openness: Digital technology
	Digital rights	Digital rights: Institutions Digital rights: Digital technology
Digital Technology Entrepreneurship (DTE)	Digital adoption	Digital adoption: Agents Digital adoption: Digital technology
	Technology absorption	Technology absorption: Agents Technology absorption: Digital technology
	Technology transfer	Technology transfer: Agents Technology transfer: Digital technology
Digital Multi-sided Platform (DMP)	Networking	Networking: Agents Networking: Users
	Matchmaking	Matchmaking: Agents Matchmaking: Users
	Financial facilitation	Financial facilitation: Agents Financial facilitation: Users
Digital Technology Infrastructure (DTI)	Digital access	Digital access: Institutions Digital access: Digital technology
	Digital freedom	Digital freedom: Institutions Digital freedom: Digital technology
	Digital protection	Digital protection: Institutions Digital protection: Digital technology

Source: Szerb et al. (2022)

Today's digital technologies considerably affect the conception and launch of brand-new commercial enterprises. The new technological paradigm is tapping into teamwork and shared knowledge to create and start more successful and long-lasting business ventures (Elia et al. 2020). The latter underline that despite the importance and timeliness of digital entrepreneurship, the impact of digital technologies and collaboration on the entrepreneurial process is rarely discussed in the literature. Sahut et al. (2021) argue that academics and policymakers alike are interested in studying the causes and conditions that

foster digital entrepreneurship because of its beneficial effects on the economy and creating new jobs. Using a lens that zeroes in on how digital entrepreneurs generate digital value through acquiring, processing, and distributing digital information, they explain some pertinent concepts and briefly map current research.

Scholars have analysed the rise of platformisation, offering diverse perspectives on its implications. Some argue that it represents a significant departure from previous economic models, giving rise to a new form of capitalism (Fuchs 2021; Sam 2020). Others suggest it primarily intensifies and accelerates neoliberal trends (Boyer 2022; Peck–Phillips 2020; Zwick 2018). While much of the literature frames platform capitalism as a global and transnational phenomenon (Graham–Anwar 2019), some scholars highlight its localised and context-dependent nature, asserting that its disruptions and challenges are shaped by national conditions (Thelen 2018; van Doorn et al. 2021). Törnberg (2023) discusses the impact of digital platforms on contemporary capitalism, suggesting that they represent both a continuation and intensification of existing neoliberal trends rather than an entirely new form of capitalism. The latter makes three main arguments:

- Digital capitalism builds on long-standing post-Fordist trends like financialisation, digitalisation, and privatisation, leading to the rise of proprietary digital markets controlled by large transnational platforms.
- These platforms challenge state power and public institutions through unique strategies, resulting in varied institutional transformations across different regions.
- While these digital markets reflect ongoing trends, they also introduce new pressures that create significant changes in social regulation, which can be viewed through three lenses: a shift from neoliberalism to techno-feudalism, a transition from Taylorist structures to algorithmic and technoliberal frameworks, and a move from postmodernity to an automated consumer culture.

DIGITAL AND ENTREPRENEURIAL ECOSYSTEMS AND PLATFORM-BASED ECONOMIES IN BELGIUM

Some indicators of digital and entrepreneurial ecosystems and platform-based economies for Belgium and comparator countries

In this section, we contemplate selected quantitative indicators that measure to some extent the digital and entrepreneurial ecosystems and platform-based economies from different sources of international and other organisations in Belgium and the comparator countries, the Netherlands and Luxembourg (Table 2). We examine these indicators in contrast to the DPE Index and its sub-indices and pillars in the next section.

Table 2. *Entrepreneurship and digital indicators for Belgium and comparator countries*

Sources	Indicators	Belgium	Netherlands	Luxembourg
[1]	Ease of doing business ranking (2020)	46 (75.0)	42 (76.1)	72 (69.6)
[2]	Global competitiveness index ranking (2019)	22 (76.4)	4 (82.4)	18 (77.0)
[3]	National entrepreneurial context index (2022)	–	5.9	4.6
[4]	Global innovation index (2024)	47.7 (15)	58.8 (5)	49.1 (12)
[5]	SME contribution to employment, %	65	64	66
[6]	SME contribution to value added, %	57	62	63
[7]	Self-employed, % of total employment, ILO (2022)	15.1	16.4	10.7
[8]	Total early-stage entrepreneurial activity, % (2023)	–	13.7	9.7
[9]	Established business ownership rate, % (2023)	–	6.9	4.2
[10]	Global entrepreneurship index ranking (2019)	17 (62.2)	8 (72.3)	20 (58.1)
[11]	Digital economy and society index ranking (2022)	16 (50.3)	3 (67.4)	8 (58.9)
[12]	Digital entrepreneurship systems ranking (2020)	9 (57.1)	3 (72.8)	7 (64.5)
[13]	Ease of doing digital business ranking (2019)	19 (2.99)	3 (3.41)	–

Sources: [1]: World Bank (2020); [2]: Schwab (ed. 2019); [3], [8] and [9]: GEM (2023); [4]: Global Innovation Index 2024; [5] and [6]: OECD (2021); [7]: Database of the World Bank, <https://data.worldbank.org/indicator/SL.EMP.SELF.ZS>; [10]: Acs et al. (2020); [11]: EC (2022); [12]: Autio et al. (2020); [13]: Chakravorti et al. (2019).

Several critical aspects of the regulatory environment that impact domestic firms are covered by the Doing Business report of the World Bank. This offers numerical indicators of how difficult it is to engage in activities like forming a company, obtaining a building permit, connecting to the power grid, registering property, securing financing, safeguarding the interests of underrepresented investors, filing tax returns, conducting international trade, enforcing contracts, or handling bankruptcy. It also assesses aspects associated with hiring workers and contracting with the government that are not accounted for in the ranking. The World Bank (2020) ranks Belgium 46th with a score of 75.0, while the Netherlands and Luxembourg are ranked 42nd and 72nd with 76.1 and 69.6, respectively (Table 2). Belgium has progressively been improving in the following areas of business regulation: starting a business, credit and electricity, employing workers, enforcing contracts, paying taxes, registering property, resolving insolvency and trading across borders since 2008. Namely, Belgium has facilitated the process of establishing a company by eliminating the paid-in minimum capital requirement and lowering the corporate income tax rate, raising the notional interest deduction rate, and cutting the rates for employer-paid social security contributions in Doing Business 2020.

According to the Global Entrepreneurship Index (GEI), which assesses the quality of entrepreneurship in a country and the scope and complexity facilitating the entrepreneurial ecosystem, Belgium is ranked 17th, with a score of 62.2, whereas the Netherlands and Luxembourg are ranked 8th and 20th with 72.3 and 58.1, respectively (Table 2). This index (Acs et al. 2020) consists of three sub-indices: (1) Entrepreneurial attitudes; (2) Entrepreneurial abilities; and (3) Entrepreneurial aspiration. In Belgium, these sub-indices are ranked 27th (49.8), 12th (67.4) and 13th (69.4), respectively. The first sub-index, entrepreneurial attitudes, shows the attitude of societies toward entrepreneurship, and Belgium had the lowest score on this sub-index in 2019.

The European Commission has been tracking the digital progress of Member States and has issued yearly Digital Economy and Society Index (DESI) assessments since 2014. Every year, the reports encompass country profiles that assist Member States in pinpointing areas for priority action and thematic chapters that support an EU-level analysis in crucial digital policy areas. This index rates Member States based on their level of digitisation and examines their relative progress over the last five years, taking into account their starting point. In the DESI Report in 2022 (EC 2022), Belgium is placed 16th with a score of 50.3 (less than the EU score of 52.3), while the Netherlands and Luxembourg are ranked 3rd (67.4) and 8th (58.9) (Table 2). The DESI has the following four components (dimensions): (1) Human capital; (2) Connectivity; (3) Integration of digital technology; and (4) Digital public services.

Belgium stands in 13th place out of 27 EU countries based on human capital. The country ranks equal to the EU average in respect of the proportion of people with basic digital skills (54%) and those with above-basic digital skills (26%). It only slightly outperforms the EU in terms of individuals with at least basic digital content creation skills (67% versus 66% for the EU). Approximately one-third of Belgian businesses offer ICT training to their employees. While this is more than the EU average, it is lower than in 2019. The proportion (5.6%) of ICT specialists in Belgium is a little greater than the EU average (4.5%), and the country has a more significant proportion of female ICT specialists. However, concerning the number of ICT graduates, Belgium ranks far worse than the EU average and has witnessed relatively little growth in this field in recent years.

Belgium ranks 27th out of 27 EU countries for the connectivity component of the DESI, the worst in the EU. Belgium has made little progress toward fulfilling the Digital Decade ambitions regarding fixed connections. While Belgium has essentially completed next generation access (NGA) network coverage and outperforms the EU average in this, the development of Very High Capacity Networks has been gradual. Only 69% of households are covered, which is lower than the EU average. Belgium rates first in terms of the provision of fixed broadband of at least 100 Mbps, with 56% of the market covered, higher than the EU average by 15 percentage points. Nevertheless, 1 Gbps take-up remains very low (0.53% compared to the EU average of 7.58%).

For digital technology integration, Belgium is ranked sixth among EU countries. One of the country's strengths is its usage of innovative digital technologies. Belgian businesses, notably SMEs, are taking advantage of e-commerce opportunities: 30% of SMEs sell online (the EU average is 18%), 15% sell cross-border, and 15% of their revenue is generated online. Social media is used by 45% of Belgian businesses, up from 34% in 2019, whereas electronic information exchange is used by 57%. Forty-seven percent use cloud services, and 23% use big data analysis (compared to 34% and 14% on average in the EU). Notwithstanding this overall strong performance, Belgian businesses still have a long way to go regarding e-invoicing and using ICT for reasons of environmental sustainability.

The varied performance of Belgium's digital public services reflects its 16th position in the EU countries. Belgium's advantages are the proportion of e-government users (74%, compared to the EU average of 65%) and the usage of pre-filled forms (with a score of 73 compared to the EU average of 64). Yet Belgium, with a score of 72, rates marginally lower than the EU average of 75 on the indicators of digital public services for citizens and digital public services for businesses (81 versus an EU average of 82). It also performs poorly in terms of open data.

Chakravorti and Chaturvedi (2017) point out that as the digital economy continues to have an ever-increasing impact on global growth, nations should pay special attention to the “digital competitiveness” of their respective economies by fortifying digital and analogue infrastructures. Further, they must look at the fact that digital platforms offer a ticket to inclusion in the global economy and that governments and policymakers that want to create inclusive growth among their citizens should seek to increase access and remove barriers to digital platforms. Chakravorti et al. (2019) ask the following question: How simple is it for the most powerful digital platforms to come into being, work, develop, or depart from global markets, and what are the primary promoters and impediments? In their search for answers, they use 236 variables from over 60 data sources from 42 countries, including public databases from the World Bank and the World Economic Forum, subscription services like GSMA and Euromonitor, and proprietary sources like Akamai, Chartbeat, and Private Capital Research Institute. To build an integrated representation of “digital business,” they explore four types of digital platforms that represent distinct value propositions and primary business models: e-commerce platforms, digital media platforms, sharing economy platforms, and online freelance. In the *Ease Of Doing Digital Business 2019* report by Chakravorti et al. (2019), Belgium is ranked 19th with a score of 2.99 (its range: 0–5) out of 42 countries in terms of the ease of doing digital business, whereas the Netherlands ranks 3rd (3.41) (Table 2). What is more, Belgium stands at 15th (3.28), 25th (2.74), 22nd (2.76) and 19th (2.93) in terms of e-commerce, digital media, sharing economy and online freelance, respectively.

Literature review for Belgium

There is limited research focused on Belgium’s digital and entrepreneurial ecosystems, or its platform-based economies. Clarysse et al. (2014) inquire into 138 innovative start-ups in Flanders, a small region in northern Belgium, founded between 2005 and 2011, focusing on their knowledge and business ecosystems as well as their financial support networks. The main result indicates that the knowledge ecosystem in Flanders is well-structured and is focused on key stakeholders. In contrast, the local business ecosystem is largely underdeveloped. Furthermore, the financial support network is predominantly funded by public sources; however, it fails to establish a connection between the knowledge and business ecosystems. These findings underscore significant policy implications for the enhancement of local ecosystem development.

Universities are becoming increasingly strategic in generating entrepreneurial

capital as part of their commitment to contributing positively to society. Hove and Clarysse (2017) investigate the factors influencing the tendency of higher education institutions in Belgium to foster an entrepreneurial and knowledge-driven ecosystem. They specifically focus on Flanders, the largest autonomous region in Belgium, and explore how the role of Flemish universities has transformed from isolated powerhouses to organisations that engage with external boundaries. Through a case study approach, they outline several strategic options for Belgian universities seeking to advance their university-centric ecosystems: (1) developing suitable infrastructure and innovative methods to promote diversity; (2) employing a differentiated strategy to build financial support networks; (3) improving enterprise education; and (4) supporting grassroots entrepreneurial initiatives. To fully leverage the value generated within the university ecosystem, each institution must also find ways to engage all participants who can reap its benefits. Manjon et al. (2022) explore the connection between smart city initiatives and the emergence of new businesses, focusing on rates of green and digital entrepreneurship, as smart cities often prioritise sustainability and digital advancements. Our research analysed data from various Belgian municipalities to establish a causal link between smart city initiatives and entrepreneurship rates. This connection is notably stronger when initiatives are implemented using a bottom-up approach and have a high execution level. Conversely, while sustainable and digital focuses in smart city initiatives do not significantly impact entrepreneurship rates overall, the exception is digital entrepreneurship in larger municipalities. These findings indicate that smart city initiatives can serve as effective local policies for promoting entrepreneurship and underscore that smart cities are primarily, but not exclusively, linked to technological progress in larger urban areas.

Hendrikse et al. (2020) contend that the contributions of Belgian entrepreneurs and politicians in evaluating the locational advantages of Brussels, as shaped by evolutionary economic geography, play a crucial role in influencing the future of global financial networks. They thoroughly address Brussels to explore how Fintech presents a significant financial service opportunity. Belgium has formulated a strategy to take advantage of this opportunity by capitalising on its image of political neutrality and Brussels' established role in financial collaboration and infrastructure. The presence of significant entities like SWIFT and Euroclear highlights this position. In addition, they scrutinise how these influential players connect large financial institutions with smaller tech startups to foster a Fintech ecosystem that supports established financial entities, forming a Fin-Tech-State triangle. Esposito et al. (2024) use an interpretive approach to explore how local policymakers express and rationalise their visions for digital

governance initiatives at the municipal level. This focuses on innovative city projects initiated by various Belgian municipalities as part of the ‘Intelligent Territory’ initiative launched by the Walloon Region in 2019. Utilising Boltanski and Thévenot’s theory of orders of worth, they employ quantitative and qualitative content analysis to classify the different justifications presented by municipal governments. The findings reveal not only the multifaceted nature of the smart city concept but also highlight the diverse range of opportunities that smart city policies provide, leading municipal policymakers to foster a sense of optimism and hope for the future.

ANALYSIS OF BELGIUM’S DPE INDEX 2020

Analysis of the overall DPE Index and its four sub-indices

The DPE Index is based on the framework with twelve components that work together to promote digital and entrepreneurial ecosystems. Szerb et al. (2022) document the DPE Index, its four sub-indices and the values for each of the twelve pillars for 116 nations and propose a cluster analysis based on these numbers. Table 3 illustrates the score and ranking of the DPE Index and its four sub-indices for Belgium, comparator countries and some clusters of countries. To examine the similarities and differences among countries, Szerb et al. (2022) categorise them into four cluster groups: Leaders (7 countries, DPE Index = 77.7), Followers (20 countries, DPE Index = 61.3), Gainers (35 countries, DPE Index = 35.9), and Laggards (54 countries, DPE Index = 17.4). Belgium and Luxembourg are members of the Followers, and the Netherlands is one of the Leaders, a group of twenty developed countries. The fundamental characteristic of this cluster is that some components of the digital entrepreneurship ecosystem are highly established, whereas others earn poor ratings. Belgium rates 17th with a score of 62.5 on the DPE Index 2020 and performs better than the averages of the EU, high-income country and Followers (52.8, 52.9 and 61.3, respectively). For four sub-indices of the DPE Index 2020, Belgium is placed 18th (64.0), 17th (61.4), 15th (64.9) and 17th (59.6) on the DTI, DUC, DMP and DTE, respectively (Table 3). We can see that Belgium’s scores on the four sub-indices are even more balanced, ranging from 64.9 (DMP) to 59.6 (DTE), with a 5.3% difference.

Table 3. *DPE Index 2020 and four sub-indices for Belgium and comparator countries*

	Countries	DPE Index		DTI		DUC		DMP		DTE	
		Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
1	Belgium	17	62.5	18	64.0	17	61.4	15	64.9	17	59.6
2	Netherlands	3	82.4	1	90.5	4	74.1	2	86.3	4	78.7
3	Luxembourg	12	65.6	10	73.7	14	65.6	17	60.3	14	63.0
4	Followers	–	61.3	–	64.8	–	60.8	–	61.2	–	58.4
5	European Union	–	52.8	–	55.6	–	53.0	–	51.6	–	50.8
6	HICs*	–	52.9	–	55.2	–	52.0	–	53.1	–	51.2

Source: Author's elaboration based on the data of Szerb et al. (2022).

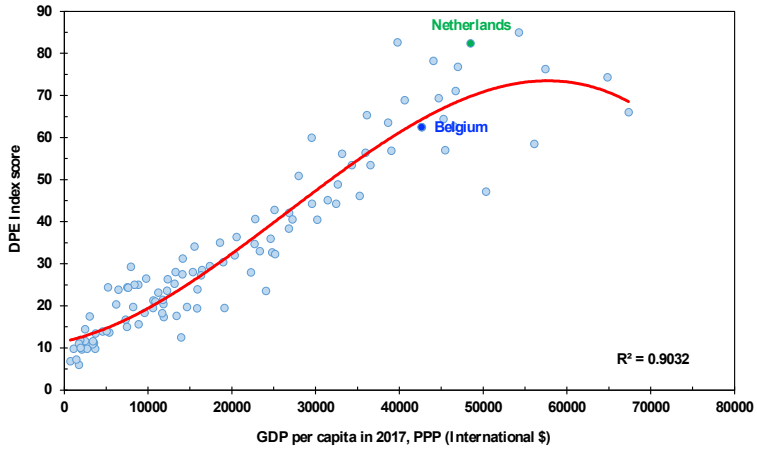
Note: *High-income countries (HICs).

Netherlands and Luxembourg, two neighbours of Belgium, surpass Belgium in all indicators except for the ranking (17th) and score (60.3) for Luxembourg (Table 3). There are many excellent experiences for Belgium to learn from, especially from the Netherlands, which was ranked third on the DPE Index 2020 with a score of 82.4. More specifically, the Netherlands ranks 1st (90.5), 4th (74.1), 2nd (86.3) and 4th (78.7) on the DTI, DUC, DMP and DTE for four sub-indices of the DPE Index 2020, respectively. Luxembourg is rated 12th on the DPE Index 2020 with a score of 65.6 and ranks 10th (73.7), 14th (65.6), 17th (60.3) and 14th (63.0) on the DTI, DUC, DMP and DTE, respectively. The differences between the lowest and highest scores are 16.4% (Netherlands) and 13.4% (Luxembourg).

Figure 1 shows a strong association between economic development (measured by real GDP per capita) and the DPE Index (digital platform-based ecosystem). We should remember that we are not implying causation here; instead, we are merely pointing out the close relationship between development and the digital entrepreneurship ecosystem. Belgium is below the regression line, estimated by the third-order polynomial (R squared equals 0.9, which means that the DPE Index explains about 90% of the proportion of variance in the GDP per capita PPP – and see Equation 5.1, Szerb et al. (2022), whereas the Netherlands is above it. Luxembourg is not included in this figure because it has a GDP per capita higher than 65,000 (PPP, International \$).

Scores for digital and entrepreneurship ecosystems are exhibited in Figure 2. Belgium scores 74.4 and 75.3 on digital and entrepreneurship ecosystems, respectively, while the Netherlands and Luxembourg are awarded scores of 84.6 and 88.2 and 79.4 and 82.5. The development of digital and entrepreneurship ecosystems in Belgium is more balanced, although it is poorer than in Luxembourg and the Netherlands. The entrepreneurship ecosystem scores higher in these three countries than the digital ecosystem.

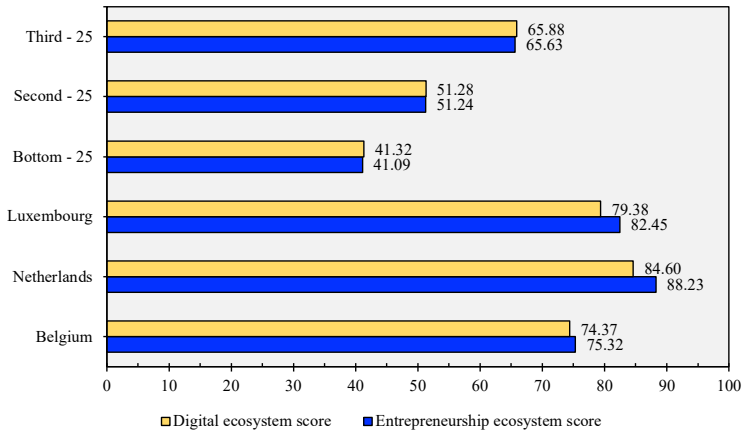
Figure 1. Relationship between GDP per capita and DPE Index 2020 score



Source: Author's elaboration based on data from Szerb et al. (2022).

Note: Authors exclude the countries that are oil-rich and have a GDP per capita higher than 65,000 (PPP, International \$).

Figure 2. Score comparison of Digital and Entrepreneurship ecosystems



Source: Author's elaboration based on data from Szerb et al. (2022).

Analysis of the twelve pillars of the DPE Index

In the previous section, we looked at the ranking and score of the DPE Index and its four sub-indices in the chosen countries (Belgium) and the comparator countries (Netherlands and Luxembourg). Szerb et al. (2022) accentuate that a healthy digital entrepreneurship economy necessitates balancing digital and entrepreneurial elements. The DPE Index's pillar-based analysis allows us to clarify our concepts of the digital entrepreneurship ecosystem and the platform-based economy and to analyse and compare Belgium's position in the DPE Index 2020 in more detail. The comprehensive profile of the DPE Index 2020 (digital entrepreneurship ecosystem) for Belgium is presented in Table 4. This complete profile consists of scores for digital and entrepreneurship ecosystems (two variables), twelve pillars, four sub-indices, and the DPE Index 2020.

Table 4. *Scores of four sub-indices, twelve pillars and DEEs for Belgium*

	Sub-Indices/Pillars	Pillar/ Sub-index score	Entrepreneurship ecosystem score	Digital ecosystem score
DTI	Digital access	59.7	60.6	79.6
	Digital freedom	58.8	81.6	63.4
	Digital protection	78.9	93.2	84.2
	Digital Technology Infrastructure	64.0		
DUC	Digital literacy	50.0	79.3	84.2
	Digital openness	66.2	73.6	84.9
	Digital rights	72.3	84.4	67.1
	Digital User Citizenship	61.4		
DMP	Networking	65.8	73.7	77.0
	Matchmaking	61.0	68.0	68.0
	Financial facilitation	73.2	71.0	89.8
	Digital Multi-Sided Platform	64.9		
DTE	Digital adoption	69.5	79.0	68.6
	Technology absorption	48.2	59.2	68.8
	Technology transfer	64.4	77.9	74.0
	Digital Technology Entrepreneurship	59.6		
	<i>Digital Platform Economy Index</i>	<i>62.5</i>	<i>75.3</i>	<i>74.4</i>

Source: Author's elaboration based on data from Szerb et al. (2022).

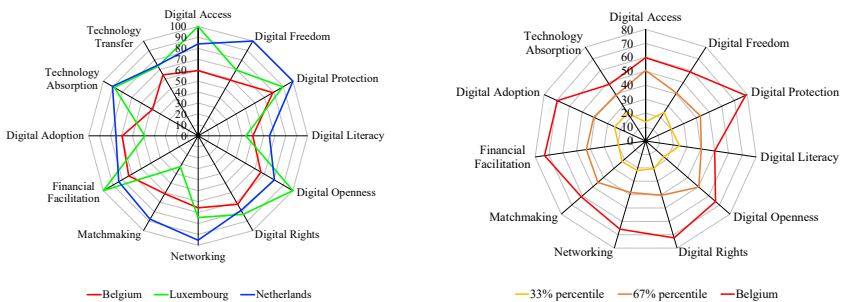
Notes: White and grey cells with scores express the second from the top and top quartiles, respectively. DEEs: Digital entrepreneurship ecosystems.

Regarding the position, all sub-indices and pillars for Belgium are in the top quarter from 116 countries. Nevertheless, Belgium is positioned slightly higher

than the average of Followers (61.3) but has much lower scores in some pillars than the comparator countries. Technology absorption (48.2) and digital literacy (50.0) are the two pillars with the lowest scores. Belgium pays more attention to improving these two pillars' positions at the policy level. The shortcomings of the entrepreneurial and digital ecosystems have an impact on the pillars with lower ratings. More precisely, digital access (60.6), matchmaking (68.0), and technology absorption (59.2) are poor in the entrepreneurship ecosystem, and their scores rate in the second quartile from the top, while only matchmaking is weak in the digital ecosystem, and its score is also in the second quartile from the top.

The comparisons of the twelve pillars in the DPE Index for Belgium are depicted in Figure 3. Part (a) of Figure 3 compares the twelve pillars in the DPE Index for Belgium with the Netherlands and Luxembourg, and we can see that the Netherlands outperforms Belgium in all pillars, whereas Luxembourg tops Belgium in all pillars except for digital literacy, matchmaking, and digital adoption. Part (b) of Figure 3 demonstrates the comparisons of twelve pillars in the DPE Index for Belgium with 33% and 66% percentiles, and Belgium leads these percentiles in all pillar scores. Luxembourg takes the full scores in digital access, digital openness and financial facilitation, while the Netherlands gets a perfect score for digital freedom and digital protection.

Figure 3. Comparison I of the DPE Index's twelve pillars for Belgium

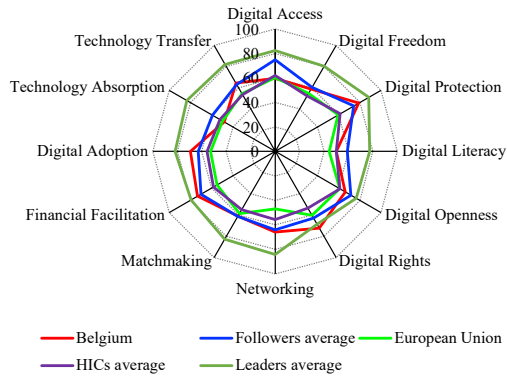


a) Comparison between Belgium and the comparator countries

b) Comparison between Belgium and different percentiles

Source: Author's elaboration based on data from Szerb et al. (2022).

Figure 4. Comparison II of the DPE Index's twelve pillars for Belgium



Source: Author's elaboration based on data from Szerb et al. (2022).

Figure 4 illustrates the comparison of the performance of the DPE Index's twelve pillars for Belgium with the averages of Followers, the European Union, high-income countries, and Leaders. In Belgium, the scores of other pillars, except for digital access, digital freedom, digital literacy, digital openness, and technology absorption, dominate the Followers on average. In addition, Belgium performs better than the averages of the European Union and high-income countries, unless only two pillars, digital access and technology absorption. Only the score of digital rights (72.3) in Belgium is better than the Leaders' average (68.5).

POLICY ANALYSIS AND RECOMMENDATION

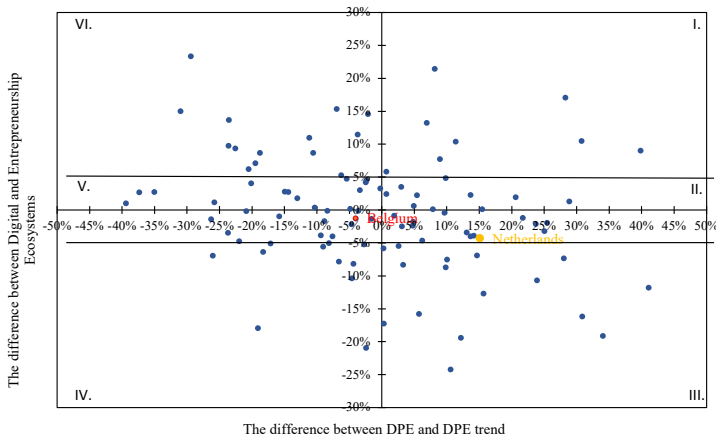
Quadrant analysis

In the previous section, we delved into Belgium's position in the DPE Index and its four sub-indices and twelve pillars. Based on these detailed analyses of the DPE Index, which measures the importance of the digital platform economy, we undertake quadrant analysis and policy optimisation, which create the foundation for the principal policy recommendation. The 116 countries are divided into six quadrants² in Figure 5. The values on the horizontal axis

² A clear explanation of the six quadrants is given by Szerb et al. (2022: 35–36).

represent the percentage difference between the DPE Index trend line and the actual DPE Index score. We use here the previous result relating to the DPE Index trend-line calculated using per-capita GDP (see Figure 1).³ The percentage difference between the digital and entrepreneurship ecosystems scores is on the vertical axis.

Figure 5. The six groups of countries based on the difference between the DE and EE scores and the deviation from the estimated development trend line



Source: Author's elaboration based on data from Szerb et al. (2022).
 Notes: DE - Digital Ecosystem; EE – Entrepreneurship Ecosystem.

We presume that a deviation of -5% from the estimated development trend line or a difference of -5% to 5% between the scores for digital and entrepreneurship ecosystems is agreeable. Policy changes are recommended if the difference is more than these numbers. Belgium is located in the middle-left area, which is the 5th quadrant, meaning that Belgium has a lower DPE Index score than similarly developed countries on average. The components' share in the digital and entrepreneurial ecosystems is between -5% and 5% . Belgium should maintain the balance between DE and EE and spending for the DPE Index to sustain its development. The Netherlands is in the middle-right area (the second quadrant) and scores higher on the DPE Index than other similarly developed nations. In both countries' cases, there is no policy intervention based on this quadrant analysis. In Table 5 of Szerb et al. (2022: 37–38), we can investigate more detailed results of the quadrant analysis for 116 countries. Namely, there

³ See in more detail in Szerb et al. (2022: 35).

is a policy suggestion that Luxembourg should maintain the balance between digital and entrepreneurship ecosystems.

Increase the DPE scores by 5% and 10%: Optimising additional resources

Suppose we more deeply investigate the country ranks of the DPE Index, four sub-indices, and twelve pillars in 2020. In this case, some countries are relatively imbalanced as regards the digital and entrepreneurship components, even though they are in the group of Leaders or Followers on the DPE Index. We confront the tricky question, “Which pillars should we alter, and by how much, if the policy of enhancing the digital entrepreneurial ecosystem is implemented?”

The DPE Index reveals obstacles in the digital platform economy with the help of the “Penalty for Bottleneck” (PFB) algorithm, which penalises ecosystem pillars in line with poorly performing pillars and offers sound policy recommendations. In other words, we can advance the DPE Index and sub-indices by upgrading the weakest pillars. If all average-adjusted pillar scores are relatively equal, the system should theoretically be optimal. Imbalance, on the other hand, implies the wasteful use of resources. What is more, the idea of bottlenecks stems from the recognition that various elements within an ecosystem work together to enhance overall performance. Since individual components cannot entirely replace one another, underperforming elements clearly create bottlenecks that prevent the ecosystem from maximizing its strengths. A vital aspect of the bottleneck concept is that some factors may disproportionately limit system performance, regardless of their importance. The PFB methodology enables us to identify potential bottlenecks in any system and evaluate how much system performance could be impacted.

The following analyses illustrate scenarios wherein extra policy measures were implemented to attain a 5% and 10% rise in the overall DPE Index score. As shown in Table 5, this analysis demonstrates how to strategically distribute the additional policy efforts among the 12 pillars, based on the assumption that it costs the same to improve performance across the pillars. The calculations were made by concentrating policy initiatives on the most urgent bottleneck until it is resolved before addressing the next most critical issue, and so on.

As we know, Belgium ranks 17th with a score of 62.5 and belongs to the group of Followers on the DPE Index 2020. Moreover, four sub-indices of the DPE Index in Belgium are well-balanced. Table 5 exhibits the required changes and new scores in Belgium after 5% and 10% increases in the DPE Index according to the PFB methodology. As seen in Table 4, the five pillars with

Table 5. Belgium’s results for the penalty associated with the bottleneck methodology: Required change and new scores after 5% and 10% increases in the DPE Index

Sub-Indices /Pillars	Actual score	5% increase			10% increase			
		Required increase in pillar	% of total new effort	New score	Required increase in pillar	% of total new effort	New score	
DTI	Digital access	59.7	1.0	4%	60.7	7.0	12%	66.7
	Digital freedom	58.8	1.0	4%	59.8	8.0	14%	66.8
	Digital protection	78.9	0.0	0	78.9	0.0	0	78.9
	<i>Digital Technology Infrastructure</i>	<i>64.0</i>	<i>1.6</i>	<i>8%</i>	<i>65.6</i>	<i>6.5</i>	<i>25%</i>	<i>70.5</i>
DUC	Digital literacy	50.0	10.0	42%	60.0	17.0	29%	67.0
	Digital openness	66.2	0.0	0	66.2	0.0	0	66.2
	Digital rights	72.3	0.0	0	72.3	0.0	0	72.3
	<i>Digital User Citizenship</i>	<i>61.4</i>	<i>4.4</i>	<i>42%</i>	<i>65.8</i>	<i>6.7</i>	<i>29%</i>	<i>68.1</i>
DMP	Networking	65.8	0.0	0	65.8	1.0	2%	66.8
	Matchmaking	61.0	0.0	0	61.0	6.0	10%	67.0
	Financial facilitation	73.2	0.0	0	73.2	0.0	0	73.2
	<i>Digital Multi-Sided Platform</i>	<i>64.9</i>	<i>1.4</i>	<i>0</i>	<i>66.3</i>	<i>4.0</i>	<i>12%</i>	<i>68.9</i>
DTE	Digital Adoption	69.5	0.0	0	69.5	0.0	0	69.5
	Technology absorption	48.2	12.0	50%	60.2	18.0	31%	66.2
	Technology transfer	64.4	0.0	0	64.4	2.0	3%	66.4
	<i>Digital Technology Entrepreneurship</i>	<i>59.6</i>	<i>4.9</i>	<i>50%</i>	<i>64.5</i>	<i>7.7</i>	<i>34%</i>	<i>67.3</i>
The sum of additional resources		–	24.0	100%	–	59.0	100%	–
<i>Digital Platform Economy Index</i>		<i>62.5</i>	<i>3.1</i>	<i>–</i>	<i>65.6</i>	<i>6.2</i>	<i>-</i>	<i>68.7</i>

Source: Author’s elaboration based on data from Szerb et al. (2022).

the lowest score in Belgium are technology absorption, digital literacy, digital freedom, digital access, and matchmaking. There is an obvious necessity of enhancing these pillars. A 5% increase in the DPE Index penalises the four pillars with the lowest scores, resulting in a 24-point rise in pillar scores, while a 10% increase in the DPE Index punishes the seven lowest-scoring pillars, resulting in a 59-point gain. Regarding a 5% increase, technology

absorption increases by 12 points (50%),⁴ digital literacy by 10 points (42%), digital freedom by 1 point (4%) and digital access by 1 point (%). As a result, four sub-indices rise by 1.6, 4.4, 1.4, and 4.9 points in DTI, DUC, DMP, and DTE, respectively. In the case of 10% of the DPE Index, the weakest seven pillars increase by 18 (31%), 17 points (29%), 8 points (14%), 7 points (12%), 6 points (10%), 2 points (3%), and 1 point (2%) in technology absorption, digital literacy, digital freedom, digital access, matchmaking, technology transfer, and networking, respectively. Accordingly, four sub-indices, DTI, DUC, DMP, and DTE, go up by 6.5, 6.7, 4.0, and 7.7 points, respectively. We can see that four sub-indices and twelve pillars, in both cases, regarding the increase in the DPE Index, are more balanced than before the rise. For example, differences between the pillars with the lowest and highest scores are 19.1 and 12.7 points, with respective increases of 5% and 10%, respectively, whereas this difference is 30.7 points before the rise in the DPE Index. Furthermore, before the DPE Index increase, the difference between the sub-indices with the lowest and highest scores was 5.3 points; now, it is 1.8 and 3.2 points, with respective increases of 5% and 10%.

CONCLUDING REMARKS

The DPE Index, created by Szerb et al. (2022), serves as the latest metric for assessing the significance of the digital platform economy, integrating insights from both digital and entrepreneurial ecosystems that have historically developed separately but are interconnected. This index consists of four sub-indices (DTI, DUC, DMP, and DTE) and twelve pillars, including digital access, digital freedom, digital protection, digital literacy, digital openness, digital rights, matchmaking, financial facilitation, digital adoption, technology absorption, and technology transfer, which together embody the digital and entrepreneurial landscapes. It follows the construction methodology outlined in the Global Entrepreneurship Index described by Acs et al. (2014). In the DPE Index 2020, Belgium ranks 17th with a score of 62.5, placing it in the Followers category. Moreover, Belgium outperforms the averages of the EU and high-income countries, displaying balanced performance across the four sub-indices. However, the five pillars where Belgium scores the lowest are technology absorption, digital literacy, digital freedom, digital access, and matching. Belgium's

⁴ The quantity in parenthesis reveals the per cent of total new effort!

DPE Index score is positioned in the middle-left quadrant of the analysis and is lower than its similarly developed counterparts. The proportion of components within the digital and entrepreneurial ecosystems varies from -5% to 5%. Belgium must balance DE and EE expenditure alongside the DPE Index to maintain development. We perform a policy analysis to calculate the necessary adjustments and anticipated new scores for Belgium following hypothetical 5% and 10% enhancements in the DPE Index using the PFB methodology. A 5% increase leads to penalties for the four lowest-scoring pillars, which results in a 24-point rise in their scores. Conversely, a 10% increase affects the seven lowest-scoring pillars, yielding a total gain of 59 points. The four sub-indices and twelve pillars show more balanced improvement following the DPE Index increase in both scenarios.

Regarding policy, Belgium's Digital Platform Economy (DPE) Index performance highlights the critical need for targeted policy measures to improve its digital and entrepreneurial landscapes. Although Belgium and other high-income countries exceed the EU average, they lag behind similarly developed nations in technology adoption, digital literacy, and access. Regarding the poor performance of these pillars, immediate action is required, including increased investment into digital infrastructure, education, and regulatory support for digital rights. Aiming for 5% and 10% improvement in the DPE Index could significantly enhance key areas and promote a more equitable digital transformation. Learning from successful practices in neighbouring countries like the Netherlands and Luxembourg may also boost Belgium's competitiveness in the digital economy.

REFERENCES

- Acs, Z. J. – E. Autio – L. Szerb (2014) National systems of entrepreneurship: Measurement issues and policy implications. *Research Policy*, Vol. 43, No. 3., pp. 476–494, DOI: <https://doi.org/10.1016/j.respol.2013.08.016>.
- Acs, Z. J. – A. K. Song – L. Szerb – D. B. Audretsch – É. Komlósi (2021) The evolution of the global digital platform economy: 1971–2021. *Small Business Economics*, Vol. 57, No. 4., pp. 1629–1659, DOI: <https://doi.org/10.1007/s11187-021-00561-x>.
- Acs, Z. J. – L. Szerb – E. Lafuente – G. Márkus (2020) *Global Entrepreneurship Index 2019*. Washington, D.C. (US), The Global Entrepreneurship and Development Institute, DOI: [10.13140/RG.2.2.17692.64641](https://doi.org/10.13140/RG.2.2.17692.64641).

- Autio, E. – L. Szerb – É. Komlósi – M. Tiszberger (2020) *EIDES 2020 – The European Index of Digital Entrepreneurship Systems*. Nepelski, D. (ed.), EUR 30250 EN, Luxembourg, (LU), Publications Office of the European Union, DOI: <https://doi.org/10.2760/150797>.
- Boyer, R. (2022) Platform capitalism: A socio-economic analysis. *Socio-Economic Review*, Vol. 20, No. 4., pp. 1857–1879, DOI: <https://doi.org/10.1093/ser/mwaa055>.
- Chakravorti, B. – R. S. Chaturvedi (2017) *Digital Planet 2017. How Competitiveness and Trust in Digital Economies Vary Across the World*. Medford (US), Institute for Business in the Global Context, The Fletcher School, Tufts University.
- Chakravorti, B. – C. Fillpovic – R. S. Chaturvedi (2019) *Ease of doing digital business 2019. Which Countries Help Expedite Entry, Growth, and Exit of Technology-Based Businesses*. Medford (US), Institute for Business in the Global Context. The Fletcher School, Tufts University, <https://sites.tufts.edu/digitalplanet/research/ease-of-doing-digital-business> [Last access: 04 20 2020].
- Clarysse, B. – M. Wright – J. Bruneel – A. Mahajan (2014) Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems. *Research Policy*, Vol. 43, No. 7., pp. 1164–1176, DOI: <https://doi.org/10.1016/j.respol.2014.04.014>.
- van Doorn, N. – E. Mos – J. Bosma (2021) Actually existing platformization: Embedding platforms in urban spaces through partnerships. *South Atlantic Quarterly*, Vol. 120, No. 4., pp. 715–731, DOI: <https://doi.org/10.1215/00382876-9443280>.
- Elia, G. – A. Margherita – G. Passiante (2020) Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process. *Technological Forecasting and Social Change*, Vol. 150., p. 119791, DOI: <https://doi.org/10.1016/j.techfore.2019.119791>.
- Esposito, G. – A. Terlizzi – M. Guarino – N. Crutzen (2024) Interpreting digital governance at the municipal level: Evidence from smart city projects in Belgium. *International Review of Administrative Sciences*, Vol. 90, No. 2., pp. 301–317, DOI: <https://doi.org/10.1177/00208523231167538>.
- EC – European Commission (2022) Digital Economy and Society Index (DESI) 2022. Published at the website of the European Commission, <https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022>.
- Feld, B. (2012) *Startup Communities: Building an Entrepreneurial Ecosystem in Your City*. Hoboken (NJ, US), John Wiley & Sons.
- Fuchs, C. (2021) *Digital Capitalism: Media, Communication and Society*. Vol. 3. New York (US), Routledge.

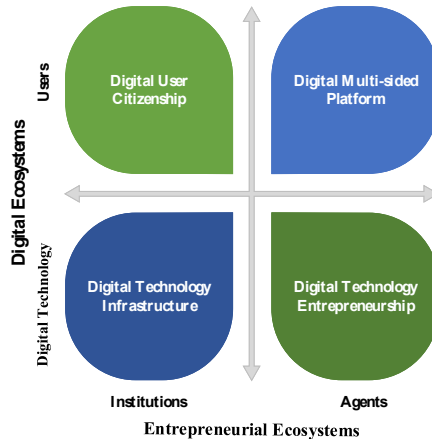
- GEM – Global Entrepreneurship Monitor (2023) *GEM 2023/2024 Global Report: 25 Years and Growing*. London (UK), GEM.
- Goldfarb, A. – C. Tucker (2019) Digital economics. *Journal of Economic Literature*, Vol. 57, No. 1., pp. 3–43, DOI: 10.1257/jel.20171452.
- Graham, M. – M. A. Anwar (2019) The Global Gig Economy: Toward a Planetary Labor Market. In: Larsson, A. – R. Teigland (eds.): *The Digital Transformation of Labor. Automation, the Gig Economy and Welfare*. London (UK), Routledge, Chapter 13, pp. 213–234, DOI: <https://doi.org/10.4324/9780429317866>.
- Hendrikse, R. – M. van Meeteren – D. Bassens (2020) Strategic coupling between finance, technology and the state: Cultivating a Fintech ecosystem for incumbent finance. *Environment and Planning A: Economy and Space*, Vol. 52, No. 8., pp. 1516–1538. DOI: <https://doi.org/10.1177/0308518X19887967>.
- Hove, J. V. – B. Clarysse (2017) The Ecosystem Approach – Rethinking Academic Entrepreneurship in Belgium. In: Siegel, D. (ed.): *The World Scientific Reference on Entrepreneurship. In 4 Volumes*. Vol. 4, Chapter 13, pp. 335–353. DOI: https://doi.org/10.1142/9789813220621_0013.
- Kenney, M. – J. Zysman (2016) The rise of the platform economy. *Issues in Science and Technology*, Vol. 32, No. 3., pp. 61–69.
- Li, W. – Y. Badr – F. Biennier (2012) Digital ecosystems: challenges and prospects. *MEDES'12: Proceedings of the International Conference on Management of Emergent Digital EcoSystems*, pp. 117–122, DOI: <https://doi.org/10.1145/2457276.2457297>.
- Manjon, M. – Z. Aouni – N. Crutzen (2022) Green and digital entrepreneurship in smart cities. *The Annals of Regional Science*, Vol. 68., pp. 1–34, DOI: <https://doi.org/10.1007/s00168-021-01080-z>.
- Nambisan, S. (2017) Digital entrepreneurship: Toward a digital technology perspective of entrepreneurship. *Entrepreneurship Theory and Practice*, Vol. 41, No. 6., pp. 1029–1055, DOI: <https://doi.org/10.1111/etap.12254>.
- OECD (2021) *OECD SME and Entrepreneurship Outlook 2021*. Paris (FR), OECD Publishing, DOI: <https://doi.org/10.1787/979a5bbfe-en>.
- Peck, J. – R. Phillips (2020) The platform conjuncture. *Sociologica*, Vol. 14, No. 3., pp. 73–99, DOI: <https://doi.org/10.6092/issn.1971-8853/11613>.
- Saadatmand, F. – R. Lindgren – U. Schultze (2019) Configurations of platform organizations: Implications for complementor engagement. *Research Policy*, Vol. 48, No. 8., p. 103770, DOI: <https://doi.org/10.1016/j.respol.2019.03.015>.
- Sahut, J.-M. – L. Iandoli – F. Teulon (2021) The age of digital entrepreneurship. *Small Business Economics*, Vol. 56, No. 3., pp. 1159–1169, DOI: <https://link.springer.com/article/10.1007/s11187-019-00260-8>.
- Sam, J. S. (2020) Book Reviews: *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. Shoshana Zuboff, New

- York: Public Affairs, 2019. *Internet Histories*, Vol. 4, No. 2., pp. 242–244. DOI: <https://doi.org/10.1080/24701475.2019.1706138>.
- Schwab, K. (ed. 2019) *The Global Competitiveness Report 2019*. Cologny/ Geneva (Switzerland), World Economic Forum.
- Song, A. K. (2019) The digital entrepreneurial ecosystem – a critique and reconfiguration. *Small Business Economics*, Vol. 53, No. 3., pp. 569–590, DOI: <https://doi.org/10.1007/s11187-019-00232-y>.
- Stam, E. (2015) Entrepreneurial ecosystems and regional policy: A sympathetic critique. *European Planning Studies*, Vol. 23, No. 9., pp. 1759–1769, DOI: <https://doi.org/10.1080/09654313.2015.1061484>.
- Sussan, F. – Z. J. Acs (2017) The digital entrepreneurial ecosystem. *Small Business Economics*, Vol. 49, pp. 55–73, DOI: <https://doi.org/10.1007/s11187-017-9867-5>.
- Szerb, L. – É. Somogyine Komlosi – Z. J. Acs – E. Lafuente – A. K. Song (2022) *The Digital Platform Economy Index 2020*. SpringerBriefs in Economics. Cham (DE), Springer, DOI: <https://doi.org/10.1007/978-3-030-89651-5>.
- Thelen, K. (2018) Regulating Uber: The politics of the platform economy in Europe and the United States. *Perspectives on Politics*, Vol. 16, No. 4., pp. 938–953, DOI: [10.1017/S1537592718001081](https://doi.org/10.1017/S1537592718001081).
- Törnberg, P. (2023) How platforms govern: Social regulation in digital capitalism. *Big Data & Society*, Vol. 10, No. 1., DOI: <https://doi.org/10.1177/20539517231153808>.
- Weill, P. – S. L. Woerner (2015) Thriving in an increasingly digital ecosystem. Published in *MIT Sloan Management Review* on June 16, 2015.
- World Bank (2020) *Doing Business 2020: Comparing Business Regulation in 190 Economies*. Washington, DC (US), World Bank. License: CC BY 3.0 IGO. <https://openknowledge.worldbank.org/bitstream/handle/10986/32436/9781464814402.pdf>.
- Zwick, A. (2018) Welcome to the Gig Economy: Neoliberal industrial relations and the case of Uber. *GeoJournal*, Vol. 83, No. 4., pp. 679–691, DOI: <https://doi.org/10.1007/s10708-017-9793-8>.

APPENDICES

Appendix A: The Digital Entrepreneurial Ecosystem

Figure A1. *The Digital Entrepreneurial Ecosystem*



Source: Acs et al. (2021)

Note: Sections shaded in green and dark green are the two biotic entities: digital users and agents.

Appendix B: The pillars of the DPE Index

Digital User Citizenship

Digital literacy is the ability to use computers and digital platforms effectively. It encompasses skills like understanding ICT terminology, using software tools like word processors and spreadsheets, and managing data and documents. Without these skills, individuals cannot fully benefit from digital infrastructure.

Digital openness is defined by how effectively a country's institutions promote access to and use of digital infrastructure. Societies must have unrestricted access to information. The creator of the World Wide Web advocated for open-access data to maximise the benefits of digitisation. A well-developed digital infrastructure, internet connectivity, and ICT tools empower users to access digital information freely, which relies on government support and regulations.

Digital rights encompass the human and legal rights that enable citizens to engage with digital infrastructure while safeguarding their privacy. Key rights

include freedom of opinion and expression, as emphasised by the *Vienna Declaration*, along with free communication, which is vital in the information society. Accessing this society includes limitless participation and respect for human rights. However, all parties must act against the misuse of digital technologies for illegal or harmful purposes.

Digital Technology Entrepreneurship

Digital adoption concentrates on entrepreneurs leveraging digital technologies to enhance efficiency, lower operational costs, and address market gaps. It is incredibly relevant for less developed countries, where digital tools can help businesses overcome infrastructure limitations and expand their reach.

Technology absorption refers to entrepreneurs' capability to integrate new and emerging digital technologies into their business models. Unlike digital adoption, which engages with widely established tools, technology absorption emphasises recognizing and utilizing less mature and potentially riskier innovations. These technologies, while uncertain, offer significant profit potential and competitive advantages. As the digital landscape continues to evolve, entrepreneurs who effectively absorb and implement these advancements can unlock new business opportunities and drive innovation in their industries.

Technology transfer emphasises the significance of spreading digital technologies for entrepreneurship. A country's capability to swiftly adopt and distribute new technologies is essential for improving efficiency and fostering development. However, the process of technological diffusion can be uneven, and the success of countries that are falling behind depends mainly on how effectively their leaders can adapt new technologies to their unique circumstances.

Digital Multi-Sided Platform

Networking focuses on understanding the network effects experienced by MSP, where the value of a service increases with the number of users. Early in a platform's launch, attracting users from both sides is crucial for success.

The matchmaking components in MSP address modern business models that differ from traditional, vertically integrated models. In MSP, buyers and sellers are considered customers who interact with each other through the platform.

Financial facilitation involves using digital technologies to enhance matchmaking in finance, enabling online transactions and connecting financial

service providers with users. Emerging technologies like AI, machine learning, automation, big data, block-chain, and new market entrants like FinTech companies and neo-banks are transforming the finance sector by offering faster, cheaper solutions and innovative financial services.

Digital Technology Infrastructure

Digital access pertains to the availability of computers, the internet, and digital tools for citizens. It is essential for participation in the digital world. The digital divide highlights the disparities in access to these resources among different cultural groups or countries.

Digital freedom refers to the level of freedom that a government allows in developing digital infrastructure. A key example of limitations on this freedom is when governments restrict internet usage for security or political reasons.

Digital protection involves the effectiveness of laws and regulations in safeguarding users from piracy and cybercrime. While it is important to maintain openness and freedom in the digital space, the risk of cyberattacks and the infringement of digital property rights could hinder its progress.

