# The Hungarian Start-up Ecosystem: A Comprehensive Overview

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This chapter explores the Hungarian start-up ecosystem, a critical component for fostering economic growth, innovation, and societal change. It begins with a historical overview, setting the stage for an analysis of Hungary's entrepreneurial journey and current start-up landscape, highlighted by key statistics. The chapter examines the societal environment, including values and perceptions surrounding entrepreneurship, and the state and governmental measures impacting the start-up sector. A detailed exploration of the funding landscape identifies key sources of capital and investment trends. Additionally, the chapter addresses entrepreneurship education, a significant barrier to the ecosystem's development. Through case studies of notable Hungarian start-up programs, the chapter showcases contributions to the ecosystem. The discussion is framed using established ecosystem models, leading to conclusions about the primary challenges facing the Hungarian start-up ecosystem, including access to funding, education, cultural attitudes, regulatory hurdles, and talent retention. Recommendations are provided to overcome these barriers, ensuring a sustainable and dynamic entrepreneurial environment in Hungary.

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## 1 Introduction

The study of start-ups and their ecosystems has gained increasing attention from scholars, policymakers, and practitioners due to its critical role in driving economic growth, innovation, and societal change. Understanding the dynamics of start-ups and the environments in which they operate is essential for fostering a vibrant and sustainable entrepreneurial landscape.

Start-ups are often regarded as engines of economic growth and job creation. They introduce new products and services, which can stimulate demand and create new markets (Schumpeter, 1942). Research has shown that start-ups contribute disproportionately to job creation compared to established firms. For instance, Haltiwanger, Jarmin, and Miranda (2013) found that young firms are a significant source of net job creation in the economy. By studying start-ups, researchers can identify the factors that enable these firms to grow and create jobs, informing policies that support entrepreneurship and economic development.

Start-ups play a crucial role in driving innovation and technological advancement. They are often at the forefront of developing and commercializing new technologies, processes, and business models (Gans & Stern, 2003). Unlike established companies, start-ups can experiment with high-risk, high-reward innovations without the constraints of existing organizational structures and market expectations. Research into start-ups helps to understand how innovation occurs, the challenges start-ups face in bringing innovations to market, and the strategies that lead to successful innovation. This knowledge is vital for fostering an environment that supports cutting-edge technological advancements (Acs, Audretsch, & Feldman, 1994).

The concept of the start-up ecosystem has become a focal point in entrepreneurship research. (We will return to this topic in more detail in a later part of this chapter.) A start-up ecosystem comprises various elements, including entrepreneurs, investors, mentors, educational institutions, and government agencies, all interacting to create a supportive environment for new ventures (Isenberg, 2010). Researching these ecosystems is crucial for identifying how these elements work together to influence start-up success. For example, Mason and Brown (2014) emphasize that understanding the local context and the specific needs of start-ups can lead to more effective support programs and policies. By analyzing different ecosystems,

researchers can identify best practices and transfer successful models to other regions, enhancing global entrepreneurial activity.

Research on start-ups and start-up ecosystems has significant policy implications. Policymakers rely on empirical evidence to design and implement programs that foster entrepreneurship. For instance, understanding the impact of tax incentives, regulatory frameworks, and funding programs on start-up formation and growth can lead to more effective policy interventions (Feld, 2012). Additionally, research can shed light on the barriers that start-ups face, such as access to capital, talent acquisition, and market entry challenges. By addressing these barriers through informed policies, governments can create a more conducive environment for entrepreneurship, leading to increased economic dynamism and resilience (Audretsch & Thurik, 2001).

Beyond economic and technological contributions, start-ups also play a significant role in driving social and cultural change. Social entrepreneurship, for example, addresses societal challenges through innovative solutions, contributing to social welfare and sustainable development (Mair & Marti, 2006). Studying these start-ups provides insights into how entrepreneurial initiatives can address pressing social issues, such as poverty, education, and healthcare. Moreover, research on cultural factors influencing entrepreneurship can help understand how societal values, norms, and networks impact entrepreneurial activity and success (Saxenian, 1994).

Among the evolving ecosystems, Hungary presents a compelling case study. This chapter introduces the start-up ecosystem of Hungary, exploring its historical roots, current state, key players, and future potential. The case study begins with a historical overview, providing context to Hungary's entrepreneurial journey. It then examines the current start-up landscape, highlighting key statistics. We will discuss the social environment surrounding start-ups and entrepreneurship in general, including societal values and the perception of the entrepreneurial sector. We will also explore the state and governmental measures that influence the start-up sector. We will delve into the funding landscape, identifying sources of capital and notable investment trends. We will address the issue of entrepreneurship education, as several studies (Csákné et al., 2022; 2023; 2024) have identified it as one of the main barriers to the development of Hungary's entrepreneurial and start-up ecosystem. The chapter will feature some case studies of notable Hungarian start-up programs shedding light on their contributions to the ecosystem. The logic of the discussion is based on the

factors of the ecosystem models introduced above. At the end of the chapter, we will make conclusions about the most significant challenges facing the development of the Hungarian startup ecosystem.

Through this comprehensive examination, readers will gain a nuanced understanding of Hungary's start-up ecosystem, appreciating its complexities, recognizing its achievements, and anticipating its future trajectory.

## 2 Literature Review

### 2.1 Defining Start-Ups: Challenges

The concept of a "start-up" is widely used in both popular and academic discourse, yet it remains challenging to define with precision. This lack of a standardized definition complicates efforts to conduct systematic research on start-ups, as the term encompasses a broad range of entities with diverse characteristics and trajectories.

One of the primary reasons defining start-ups is difficult is the variability in definitions across different contexts and disciplines (Csákné & Radácsi, 2019). According to Ries (2011), a start-up is "a human institution designed to create a new product or service under conditions of extreme uncertainty". This definition emphasizes innovation and uncertainty but does not specify size, age, or industry, making it broad. In contrast, Blank (2013) describes a start-up as "a temporary organization designed to search for a repeatable and scalable business model", focusing more on the business model discovery process. Paul Graham, the legendary start-up builder, investor, and Co-founder of Y Combinator, states that "being newly founded does not in itself make a company a start-up. Nor is it necessary for a start-up to work on technology, take venture funding, or have some sort of 'exit'. The only essential thing is growth. Everything else we associate with start-ups follows from growth." (Graham, 2012).[1]

[1] He also observed that at Y Combinator, one of the world's most successful and growth-focused start-up programs, discussions often centered on weekly growth rates rather than annual ones.

These varying definitions reflect different perspectives on what constitutes a start-up. Some definitions emphasize the newness and innovative aspect (Gartner, 1985), while others focus on the intention to scale and grow rapidly (Eisenmann, 2013). The lack of consensus on these defining attributes leads to inconsistencies in what different researchers consider to be a start-up, complicating comparative studies and meta-analyses.

Start-ups are inherently fluid and dynamic, evolving rapidly as they navigate through different stages of development. This fluidity poses a challenge for researchers who attempt to capture the essence of start-ups at a specific point in time. As start-ups progress from ideation to growth and potentially to become established companies, their characteristics and needs change significantly (Kazanjian, 1988). This dynamic nature means that what qualifies as a start-up at one stage may no longer apply to another, making longitudinal studies particularly complex.

Start-ups can be found across virtually all sectors of the economy, each with unique characteristics and challenges. For instance, tech start-ups often focus on disruptive innovation and rapid scaling, while social enterprises may prioritize mission-driven goals over profit maximization (Mair & Marti, 2006). The diversity of business models, industries, and objectives means that a one-size-fits-all definition is impractical. This heterogeneity necessitates tailored research methodologies that can account for the specific contexts and operational dynamics of different types of start-ups.

### 2.2 Implications for Research

The difficulty in defining start-ups has significant implications for research. Firstly, it affects the generalizability of research findings. Studies that adopt narrow definitions may produce results that do not apply to start-ups outside the specific context being studied. Conversely, overly broad definitions may lead to results that lack specificity and actionable insights. This variability can undermine the comparability of studies and the accumulation of a coherent body of knowledge.

Secondly, the lack of a clear definition complicates the process of identifying and sampling start-ups for research purposes (Csákné & Radácsi, 2019). Without a standardized definition, researchers may rely on self-identification or arbitrary criteria, leading to selection bias and skewed samples (Freeman & Engel, 2007). This

can affect the validity and reliability of research findings, making it difficult to draw robust conclusions about the start-up ecosystem.

The third implication is that in start-up research, there is often no opportunity to rely on classic scholarly sources. Due to the unique characteristics of the field – rapid changes and numerous transactions – information tends to appear in newspapers, magazines, and blogs rather than traditional academic literature.

## 2.3 The Ecosystem Metaphor in Entrepreneurship and Start-up Research[2]

The ecosystem metaphor has become increasingly prevalent in entrepreneurship and start-up research, offering a comprehensive framework for understanding the complex, dynamic interactions among various actors and elements that contribute to entrepreneurial success. This metaphor is useful for several reasons, providing insights into how start-ups grow, innovate, and thrive within their broader environment.

The word 'ecosystem' is etymologically a compound of two Greek words, οιχος ('eco') and συστημα ('system'), and describes a complex, living, and dynamic system made up of a large number of 'individuals'. The concept was first applied in biology (Tansley, 1935), who argued that living organisms cannot be separated from their characteristic environment because they form a single physical system. These systems, in the view of ecologists, are the basic units of nature on Earth.

The idea of an ecosystem in economics appeared as early as 1920 (Marshall, 1920), but the first truly ecosystem model was not published until 1982 (Nelson & Winter, 1982). In this model, the authors sought to link profit maximisation and survival at the systemic level by combining it with Darwinian evolutionary theory. The studies that laid the foundations for ecosystem thinking appeared in the 1980s and 90s, when entrepreneurship research shifted from focusing on the individual, the personality of the entrepreneur, to research on entrepreneurship as a process influenced by social, cultural and economic factors.

[2] This section is based on the 2020 study by Radácsi & Csákné.

The entrepreneurial ecosystem approach can be linked to the literature on strategy and regional development (Acs, Stam, Audretsch & O'Connor 2017). The first studies focusing on the ecosystem (or business environment) focused on the economic and social effects of regions on businesses, as in Pennings (1982), Dubini (1989), Van de Ven (1993), and Bahrami and Evans (1995). With this turn of events, the researchers also indicated that it is not possible to talk about enterprises in general terms without context.

However, location/area, which can also be seen as an important element of the environment, is not the cause of certain entrepreneurial activities but carries in itself elements of a much more complex set of impacts (Johannisson, 2011).

In the decades since then, the concept of entrepreneurial ecosystems has been of increasing interest to researchers and economic policymakers. Figure 1 shows the number of peer-reviewed academic publications on the subject in recent years:

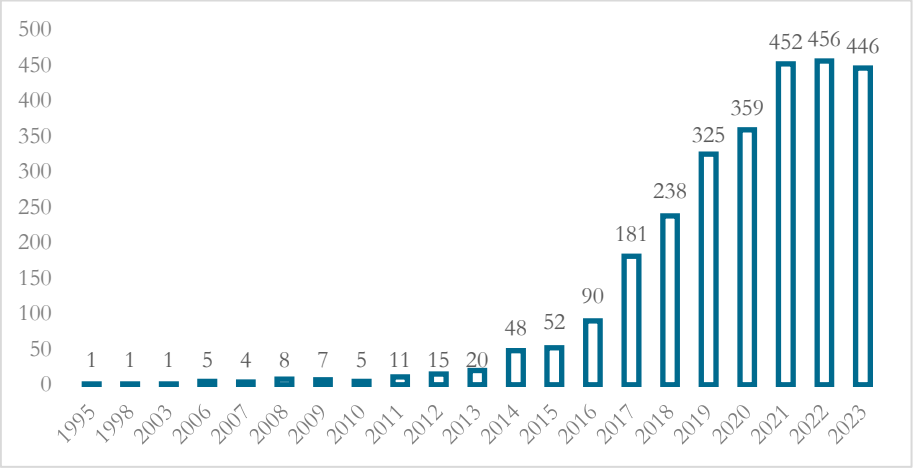


**Figure 1**: **Academic publications on entrepreneurial ecosystem 1995-2023**
Source: own ed.

Many attempts have been made to define the concept of an entrepreneurial ecosystem over the past decades, but due to the complexity and novelty of the subject and the constant and intensive changes in the field, no single, agreed definition has emerged.

The comprehensive study by Cavallo and colleagues (2019) attempted to compare and analyse the definitions that have been produced on the subject, analysing 47 definitions out of 163 relevant peer-reviewed publications, of which 16 specific definitions were examined. The main features of the definitions listed are:

- The components of an entrepreneurial ecosystem are, on the one hand, the enterprises themselves (from start-ups to successful growth to large enterprises), on the other hand, the various entrepreneurial organisations, associations, and networks, and thirdly, the supporting and related institutions (banks, universities, NGOs, etc.), and finally, the interactions and linkages between them.
- The emphasis is on complexity and a system of "non-linear", but networked, multi-level and dynamic relationships.
- It is not possible to define precise and stable boundaries, and the external linkages of an ecosystem can only be described approximately.
- The definitions differ as to whether the main objective of an ecosystem is to create new businesses, to increase the success rate of "productive" businesses, or to create highly successful "unicorn" businesses.[3]

The comparative study cites Stam's (2015:1765) definition as the most widely accepted in the literature, which states that "An entrepreneurial ecosystem is a coordinated set of independent actors and factors that result in opportunities for competitive enterprises in a particular area."

As highlighted in the study by Cavallo et al. (2019), beyond definition, the delimitation of ecosystem boundaries is a cardinal issue. What is the appropriate unit of analysis, whether the ecosystem be considered in terms of countries, regions, counties, cities, or on a smaller scale, linked to university campuses or perhaps incubators (Acs, Stam, Audretsch & O'Connor 2017).

[3] A startup unicorn refers to a privately held startup company that has reached a valuation of $1 billion or more. The term "unicorn" was coined in 2013 by venture capitalist Aileen Lee, reflecting the rarity of such successful ventures, akin to the mythical creature. Unicorns are typically characterized by their rapid growth, innovative business models, and substantial market disruption. They often operate in technology-driven industries and achieve significant funding from venture capitalists to support their expansive growth trajectories. Examples of well-known unicorns include companies like Uber, Airbnb, and SpaceX.

Another key question in ecosystem studies is whether, within a given geographical context (e.g. country), an assessment of the whole entrepreneurial ecosystem is the goal or whether a narrower focus is desirable. The local environment has a crucial impact on the development of enterprises, as Isenberg (2010) points out, developments in the entrepreneurial ecosystem must be adapted to local specificities, needs, and cultural context.

Despite variations in scope and content among entrepreneurial ecosystem models, a shared characteristic across these models is that influencing factors exert their impact through entrepreneurial performance (see Figure 2).

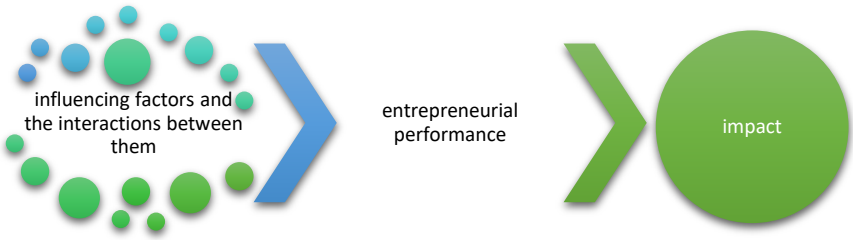


**Figure 2**: **Common structure of ecosystem models**
Source: own ed.

While an almost exhaustive list of influencing factors is presented in the literature, further analysis and research are needed to identify causal effects.

### 2.3.1 The Isenberg Model

One of the earliest and most influential entrepreneurial ecosystem models is by Isenberg (2010), comprises six main elements:

1. Culture: An inspiring and stimulating entrepreneurial culture.
2. Policy: Supportive policies.
3. Finance: Available and appropriate financing.
4. Human Capital: High-quality human resources.
5. Markets: Business-friendly markets.
6. Supports: Necessary institutional and infrastructural support.

Isenberg emphasizes the uniqueness of each ecosystem due to complex interactions among components. Identifying success factors is challenging due to the "law of small numbers". Entrepreneurial ecosystems are self-sustaining, evolving intelligently rather than through top-down creation, with state and institutional interventions playing a supportive role.

### 2.3.2 The WEF Model

The World Economic Forum (WEF, 2014) model shares significant overlap with Isenberg's principles. Developed in collaboration with experts from Stanford University, Endeavor, and EY, the WEF model provides a comprehensive framework for interpreting regional differences in entrepreneurial ecosystems. The model is focusing on eight pillars:

1. Access to markets
2. Human resources
3. Availability of funding sources
4. Support and advisory mechanisms
5. Networking opportunities
6. Professional services, accelerators, incubators, and an entrepreneur-friendly business environment
7. University entrepreneurship education and training
8. A culture of respect for research, entrepreneurship, and innovation

### 2.3.3 The ANDE Model

The Aspen Network of Developmental Entrepreneurs (ANDE) Ecosystem Toolkit emphasizes critical components for promoting entrepreneurship, especially in developing economies (ANDE, 2013). Key components include:

1. Finance: Diverse financing options.
2. Business support: Incubators, accelerators, and consulting services.
3. Markets: Local and international market access.
4. Human capital: Entrepreneurial education and workforce development.
5. Policy: Supportive regulatory environment.
6. Infrastructure: Reliable physical and technological infrastructure.
7. Culture: Societal attitudes encouraging entrepreneurship.

The ANDE model underscores the need for a supportive ecosystem where various sectors collaborate to nurture entrepreneurs, fostering a resilient environment for economic development and poverty alleviation.

### 2.3.4 The Stam Model

Stam (2015) introduces a comprehensive and integrative model, combining insights from economic geography, regional studies, and innovation systems. This model emphasizes the dynamic interactions between ecosystem components, recognizing both tangible and intangible elements. The key modules are:

1. Formal institutions: Regulatory framework and governance structures.
2. Culture: Societal attitudes and values towards entrepreneurship.
3. Physical infrastructure: Quality of transportation networks, office spaces, and communication systems.
4. Demand: Markets for entrepreneurial products and services.
5. Finance: Access to financial resources.
6. Leadership: Influential individuals or organizations driving entrepreneurial initiatives.
7. Talent: Availability of skilled individuals.
8. Knowledge: Generation and dissemination of new ideas through research institutions and universities.
9. Support services: Availability of incubators, accelerators, and consultants.
10. Networks: Connections among entrepreneurs, investors, and mentors.

Stam's model provides a robust framework for analyzing and fostering entrepreneurial activity, highlighting the importance of a supportive environment with interconnected elements.

### 2.3.5 The Global Entrepreneurship Monitor (GEM) Model

The Global Entrepreneurship Monitor (GEM) is the world's foremost study of entrepreneurship, initiated in 1999 by Babson College and London Business School. The GEM conceptual framework is based on the assumption that national economic growth results from individuals' capabilities to identify and seize opportunities, influenced by environmental factors. GEM data, gathered annually through the Adult Population Survey (APS) and the National Expert Survey (NES), assesses

entrepreneurial activity as an interaction between individual capacities and environmental conditions, benefiting the environment through social value and economic development (GEM, 2024). (See Figure 3 for the factors and the interplay between them.)

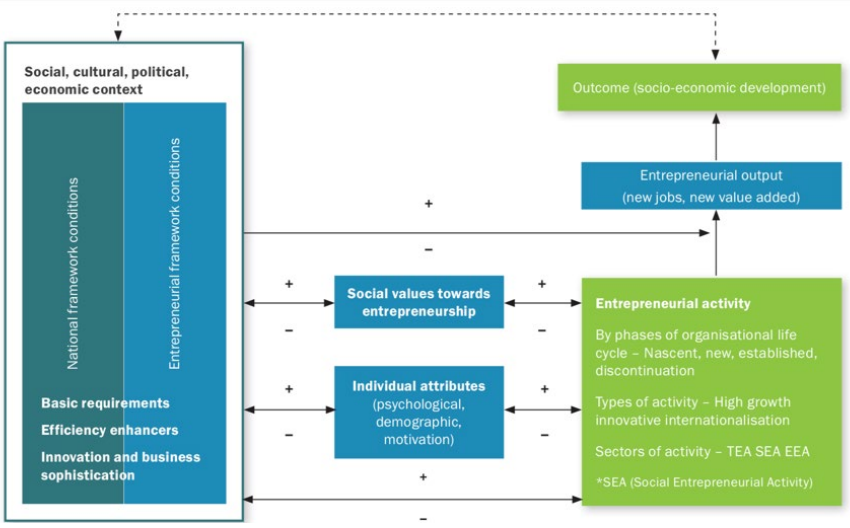


**Figure 3: The GEM Conceptual Framework**
Source: GEM, 2024

These models collectively offer comprehensive frameworks for understanding and fostering entrepreneurial ecosystems globally.

## 3 The Hungarian Start-Up Ecosystem

To assess the state of the startup ecosystem in Hungary and identify the primary developmental constraints, we employed the following methodologies:

1. **Analysis of scholarly literature**: We reviewed relevant academic publications to contextualise our findings within the existing body of research.
2. **Secondary data collection from available databases**: Data were gathered from Crunchbase, Dealroom.co, Vestbee, Startup Europe, StartupBlink, World Economic Forum, EU statistics, Startup Hungary, Hungarian Central Statistical Office, Hungarian National Bank, and Hungarian government publications.

3. **Examination of business magazines and publications**: We analysed content from business magazines and publications focusing on startups to gain insights from industry perspectives.
4. **Evaluation of websites of startup ecosystem stakeholders**: We scrutinised the websites of various stakeholders within the startup ecosystem to obtain additional data and viewpoints.

### 3.1 Historical Context

The entrepreneurial landscape in Hungary has undergone significant transformation over the past few decades. To fully appreciate the current start-up ecosystem, it is crucial to understand the historical context that shaped it. Hungary's journey from a centrally planned economy to a market-driven one has been pivotal in this evolution.

Before the 1990s, Hungary was under communist rule, which significantly constrained entrepreneurial activities. The economy was centrally planned, with the state controlling most enterprises and discouraging private ownership and market competition. Innovation and private entrepreneurship were stifled, leading to a lack of business dynamism (Kornai, 1992).

The fall of the Iron Curtain and the subsequent collapse of the communist regime in 1989 marked the beginning of a new era for Hungary. The transition to a market economy was a complex and challenging process, involving significant economic reforms, the privatisation of state-owned enterprises, and the establishment of legal frameworks to support private ownership and entrepreneurship (Csaba, 1995). During this period, Hungary opened its doors to foreign investment and integrated more closely with Western markets. The economic liberalization fostered a burgeoning private sector, although the initial years were marked by economic instability and structural adjustments (Bohle & Greskovits, 2012). This shift required dismantling the old economic structures and fostering a new entrepreneurial culture. Key aspects of this transition included:

– The *privatization* of state-owned enterprises was a major step in creating a market-driven economy. This process involved selling state assets to private investors, both domestic and foreign and encouraged the development of private enterprises (Kornai, 2006).

- Establishing a *legal framework* to protect private property, enforce contracts, and support business activities was essential. These reforms created a more predictable and secure environment for entrepreneurs (Haggard & Kaufman, 1995).
- Removing price controls, subsidies, and trade barriers allowed market forces to dictate economic activities. This *liberalization* encouraged competition and innovation (Nölke & Vliegenthart, 2009).
- Developing *institutions* that support entrepreneurship, such as financial markets, business associations, and support services, was crucial for fostering a vibrant business environment (McDermott, 2002).

Hungary's accession to the European Union in 2004 was a significant milestone that catalyzed further economic development. EU membership brought access to larger markets, structural funds, and a regulatory environment that encouraged business growth and innovation. This period saw a rise in foreign direct investment and an increase in entrepreneurial activities as businesses capitalized on new opportunities within the EU framework (Bruszt & Stark, 2003).

The 2010s witnessed the emergence of a more defined start-up ecosystem in Hungary. The government began to recognize the importance of fostering innovation and supporting start-ups as drivers of economic growth. Initiatives such as the New Széchenyi Plan, the establishment of incubators and accelerators, and targeted funding programs were introduced to support early-stage ventures (Szerb et al., 2013). Key cities like Budapest, Debrecen, and Szeged became hubs for start-ups, attracting both local and international talent. The rise of success stories like Prezi, LogMeIn, and Ustream put Hungary on the global start-up map, showcasing the potential of Hungarian entrepreneurs and their ability to compete internationally.

### 3.2 Current Start-up Landscape

The country's strategic location in Central Europe, along with its robust educational system and supportive governmental policies, has contributed to the growth of this ecosystem (Szerb et al., 2013).

### 3.2.1 Key Statistics and Metrics

To understand the current state of Hungary's start-up ecosystem, several key statistics and metrics can be highlighted:

- According to data from Dealroom.co, a global provider of information on start-ups and venture capital (VC) activity, in 2024 Hungary was home to over 1,600 start-up companies. (For which Hungary is the HQ location.) (Dealroom, 2024a)
- In the last 10 years (as of 2023), 823 start-ups have been founded, with 8 of them valued above $100 million and 1 exceeding $1 billion (GoTo, formerly LogMeIn). (See Table 1 for the 5 largest Hungary-based start-ups. Several previously high-valued start-ups have exited and therefore do not appear in the table.)[4]
- The start-up sector in Hungary has been growing steadily, with an annual growth rate of around 10-15% in the number of new ventures and funding received (Startup Hungary, 2023).
- Since 2000, VC funding in Hungary has totaled $738 million, with VC investment per capita being €7. (Compared to the European average of €78 and the CEE average of €12.) (Dealroom, 2024b)
- An analysis of the life cycle of leading Hungarian start-ups, using Dealroom funding data, reveals that initial funding predominantly originated from Hungarian sources. In contrast, larger rounds, typically Series A, attracted European investors, and it was only during Series B rounds, involving tens of millions of euros, that American venture capital investors showed interest.[5]
- According to the 2024 edition of the Startup Ecosystem Report by StartupBlink, Hungary maintained its 50th position globally for the second year in a row among the world's major start-up ecosystems, but it is far from its

[4] LogMeIn, a provider of remote connectivity services, raised substantial venture capital before going public on NASDAQ and was later acquired by private equity firms for $4,3 billion (Miller, 2019). Ustream, a live video streaming platform, was founded in Budapest and achieved global recognition. It raised over $60 million in funding before being acquired by IBM in 2016 for approximately $130 million (Primack, 2016). The IT security company Tresorit was acquired by Swiss Post in 2021. The purchase price was not disclosed (Gólya, 2021).

[5] The terms Series A, B, and C refer to specific rounds of financing from venture capital investors, categorized according to the start-up's life cycle and the amount of funding. However, there is no consensus in international literature on how to classify a particular capital raising into these rounds. Dealroom.co classifies European start-ups based on the amount of capital raised as follows: (1) Pre-seed: under EUR 1 million (2) Seed: EUR 1–4 million (3) Series A: EUR 4–15 million (4) Series B: EUR 15–40 million, and (5) Series C: EUR 40–100 million.

2020 ranking of 37th (StartupBlink, 2024). The decline is mainly due to the lack of internationally successful (unicorn) start-ups.

- According to the Global Entrepreneurship Monitor, Hungary's entrepreneurial ecosystem ranks in the middle of the pack both regionally and globally. The ease of access to business financing, commercial and service infrastructure, and government policies on taxes and bureaucracy are rated above the global and regional levels. However, there is a noticeable lag in entrepreneurial education in primary and higher education and the social and cultural norms ecosystem elements, both globally and regionally (Csákné et al., 2022; 2023; 2024).
- The total valuation of the Hungarian start-up ecosystem is $6.1 billion. Among Hungary's seven neighbouring countries, the ecosystem value is higher in three and lower in four (Dealroom, 2024a).6
- There is a significant ecosystem concentration in Budapest, hosting the majority of start-ups, incubators, accelerators, and co-working spaces. In 2023, Budapest ranked 9th among CEE start-up hubs for venture capital investment (Dealroom, 2024a). Hungary has now five ranked cities in the global top 1.000: Budapest (135), Szeged (816), Debrecen (901), Székesfehérvár (928), and Miskolc (991). All of the top three cities nationally experienced declines in their ranking in 2024 (StartupBlink, 2024).
- While only 8% of Europe's ecosystem value is derived from European start-ups that have relocated overseas, nearly 47% of CEE's ecosystem value comes from CEE start-ups that have moved abroad. For Hungary, 44% of start-ups have relocated from their country of origin, while 56% remain based in their home country.7 (Dealroom, 2022a)
- Until 2024, the number of exits has reached 106.
- There were 11 workspaces and 24 accelerators registered by Dealroom.co in 2024.
- The most funded technologies in the past three years (as of 2023) were artificial intelligence, big data, and machine learning (Dealroom, 2024a).

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[6] Over the past five years, the total value of start-ups in the CEE start-up ecosystem has more than doubled, increasing from €89 billion in 2019 to €213 billion in 2023. Notably, start-ups and scale-ups supported by venture capitalists have experienced the most rapid growth, contributing an impressive €21 billion to their value within this timeframe (Vestbee, 2024). The top three countries in terms of enterprise value for start-ups are Poland, Ukraine, and Estonia, contributing €49 billion, €28 billion, and €28 billion, respectively, to the total combined value of the CEE region. Croatia, Latvia, and Lithuania exhibited the most significant relative growth in values (Dealroom, 2024b).

[7] Start-ups founded in Ukraine, Romania and Bulgaria are most likely to have relocated their HQ abroad, in the UK, the US or Western Europe.

- The most funded industries in the past three years (as of 2023) were enterprise software, security, and fintech (Dealroom, 2024a).
- Hungary-based start-ups employ approximately 15,000 people (Dealroom, 2024a).

**Table 1: The 5 largest Hungarian start-ups based on the total funding amount and valuation**

| | Name | Market | Total founding amount (in million USD) | Valuation (in million USD) | Investors |
|---|---|---|---|---|---|
| 1. | Seon | B2B, security, fintech, identity & access regtech | 107,8 | 385-575 | Creandum, Institutional Venture Partners, PortfoLion |
| 2. | Bitrise | B2B, enterprise software | 83,5 | 240-360 | Insight Partners, Partech, Y Combinator, Fiedler Capital, Zobito |
| 3. | AIMotive | transportation, autonomous & sensor tech | 67,6 | 200 | Prime Ventures, Inventure, Draper Associates, Bosch Ventures, B Capital Group |
| 4. | Turbine AI | health, pharmaceutical, biotechnology | 34,2 | 110 | Accel, Day One Capital, Mercia Asset Management, Merck, Delin Ventures |
| 5. | Shapr3D | enterprise software | 21,8 | 58-87 | Creandum, Point Nine, Speedinvest, Thrive Capital, Lifeline Ventures |

Source: own calculations, based on the Dealroom and Crunchbase databases[8]

### 3.2.2 Societal Attitudes and Values Influencing Hungary's Start-up Ecosystem

The impact of values on attitudes and behaviours has been extensively researched over time. The notion of values as guiding, justifying, or clarifying attitudes, norms, and opinions – and thereby influencing human actions – has garnered significant consensus among social scientists (Peral & Ramos, 2014).

[8] The table includes only those companies that are currently headquartered in Hungary. Consequently, it does not list some start-ups (e.g. Colossyan, Commsignia) that, despite receiving significant funding and achievening large valuations, have relocated their headquarters to another country (typically the USA). According to the 2022 Startup Report, half of the start-ups launched in Hungary have moved their headquarters abroad (Startup Hungary, 2023).

Societal attitudes and values play a critical role in shaping the entrepreneurial ecosystem of any country. These factors influence the willingness of individuals to engage in entrepreneurial activities, the support they receive from their communities, and the overall environment in which new ventures can thrive. In Hungary, societal attitudes towards entrepreneurship are a mix of positive and negative factors that collectively impact the entrepreneurial ecosystem.

International studies have found that Hungarians are generally less trusting, less tolerant, less open-minded, more individualistic, and more competitive compared to the European average (Neumann-Bódi et al., 2008; Keller, 2009; Tóth, 2009a; 2009b; Csepeli & Prazsák, 2010; Radácsi, 2024). They also tend to believe that individual actors can only succeed at the expense of others. Additionally, the majority of Hungarians expect the government, rather than themselves, to bring about positive changes in their lives (Kopp & Skrabski, 2008). This picture is nuanced by the European Values Studies results, which indicate that distrust and lack of cooperation are not unique to Hungary, but there is a significant divide along these values between Eastern and Western Europe (Halman et al., 2022; Luijkx et al., 2022). A 2018 Oxford University study found that Hungary was ranked the fourth lowest out of 77 countries on a risk-taking index (Becker et al., 2018).

As previously discussed in the Global Entrepreneurship Monitor (GEM) model, the general social perception of entrepreneurs can significantly influence the propensity to start a business. The GEM framework evaluates the public perception of entrepreneurs through three key questions: (1) media attention towards entrepreneurs, (2) the social status of successful entrepreneurs, and (3) entrepreneurship as a desirable career choice (Csákné et al., 2023). The data published in 2024 shows that, consistent with previous years, about half of the population believes that entrepreneurs receive significant media attention (50.9%), successful entrepreneurs hold high social status (48.5%), and entrepreneurship is seen as a desirable career path (47,2%) (Csákné et al., 2024). Conversely, the proportion of people disagreeing with these statements remains significantly lower but stable (26,6%, 25,4%, and 26,5% respectively). Notably, individuals under 35 years are more likely than average to agree that entrepreneurship is a desirable career path and that entrepreneurs hold high social status.

When discussing the cultural context and the start-up culture in Hungary, the story of Prezi stands out prominently.

*Case study: Prezi as a defining enterprise in Hungary's startup culture*

Founded in Budapest in 2009 by CEO Peter Arvai, CTO Péter Halácsy, and Chief Designer Adam Somlai-Fischer, Prezi is one of Hungary's most significant start-up success stories. Alongside other tech successes like Ustream and LogMeIn, Prezi has elevated Budapest's profile among international investors.

The founders of these companies have significantly shaped the local start-up ecosystem, investing time, resources, and capital to transform Budapest into a tech hub and establishing Bridge Budapest, a six-month fellowship program for promising tech talent. Bridge Budapest nurtures the next generation of tech talent by offering selected Hungarian university students a six-month paid fellowship with leading start-ups in Hungary. The program includes opportunities to visit the United States and gain insights from Silicon Valley or other tech hubs to apply in Budapest.

Beyond start-ups, CEO Peter Arvai initiated the 'Heroes Square Project', a social project led by Dr. Philip Zimbardo to change public attitudes toward helping others.[9] Péter Halácsy launched The Budapest School to modernize education for primary school children and also established a school for teaching girls to code.

Prezi to this day serves as a role model for Hungarian start-ups. Employing team members from 27 countries, Prezi offers Budapest employees the chance to spend a month in Silicon Valley. The company maintains a closed Facebook group called Prezi Mafia (a play on PayPal Mafia), where over 200 current and former employees collaborate on new projects in Hungary and beyond.

### 3.2.3 Funding and Investment

A critical aspect of a thriving start-up ecosystem is access to funding and investment. In Hungary, the funding landscape for start-ups has been developing robustly, supported by a combination of venture capital firms, angel investors, crowdfunding platforms, and government-backed funding programs.

[9] The name "Heroes Square Project" derives from Heroes' Square (Hősök tere), a major historical and cultural landmark in Budapest. Heroes' Square is one of the most iconic locations in Budapest, known for its impressive statues and monuments that commemorate notable figures from Hungarian history. By naming the project after such a significant site, the initiative symbolically connects with themes of heroism, national pride, and societal contribution, aiming to inspire public involvement and a sense of community responsibility.

#### 3.2.3.1 Venture Capital Landscape

Venture capital (VC) is a major source of funding for start-ups in Hungary. This type of investment involves equity financing, where the investor acquires a stake in the target company. It is a financing form for non-public companies, typically for high-risk start-ups. Investments can be made directly or through funds – the latter being more common, as fund managers can manage their risks by diversifying their portfolios. The capital of VC funds comes partly from institutional investors (e.g., banks, international financial organizations, investment funds, insurance companies, etc.) and partly from individuals with significant private wealth. Fund managers raise capital for the fund based on their investment policy, track record, and network, and then make investments from this fund during the investment period.

In the 2010s, a milestone in the development of Hungary's venture capital ecosystem was the introduction of the Jeremie funds (Joint European Resources for Micro to Medium Enterprises). These funds not only put the sector on a more dynamic trajectory but also significantly reshaped domestic start-up financing. It was mainly from this period that significant activity in the venture capital investment market was observed. Consequently, local investment professionals typically have 5-15 years of experience, in contrast to the more developed markets where it is common to find investment experts with 20-30 years of experience.

Hungarian fund managers typically provide financing between EUR 1.5–3 million to mature but still growth-stage companies. The number of venture capital investments in Hungary has steadily increased in recent years, but the market size remains significantly smaller compared to the regional leaders (Poland, Estonia, Lithuania).

A regional peculiarity is that funds active here are predominantly backed by state and/or EU resources, which also influence investment opportunities and regulations (Karsai, 2022; MNB, 2023). Global and international funds rarely have a local presence and are only sporadically involved in transactions in Hungary. Regional funds generally have a more active local presence, but the processes related to transactions are typically managed from other venture capital hubs such as London, Amsterdam, or Berlin. Additionally, these funds are often sector-focused (MNB, 2023).

Access to capital in Central and Eastern European countries has been a challenge that governments have tried to mitigate through state interventions to promote economic growth and competitiveness. Following their EU accession, these countries benefited from EU funds dedicated to developing the venture capital sector, particularly through cohesion funds post-2010.

Despite these efforts, state venture capital programs in the region have shown both the positive and negative traits of similar programs in developed countries, failing to avoid previous mistakes. According to Judit Karsai's (2022) analysis, bureaucratic issues were compounded by the region's paternalistic and corrupt traditions and the difficulty in rapidly changing cultural-institutional conditions, leading to significant waste of communal resources. The increased capital supply was not always absorbed effectively, especially in finding and incentivizing private investors. Many co-investors were wealthy individuals with strong government ties, skewing the statistics.

Although the world's most developed, technology-based economies also have state programs to support high-tech industries, these programs primarily fund research, universities, and research institutions, or they place specific orders with private companies for desired technological solutions. The market competition aims to win these (often astronomical) orders, but the investment comes from market investors, not the state. In developed economies it is now clear that the state should not take a leading role in the venture capital market – this debate was settled in the developed countries by the 1990s (Florida & Smith, 1993). The state's excessive presence has already had the effect that those with truly internationally competitive, innovative business ideas prefer to establish their companies abroad or seek funding there. In this, it is not the availability of funds but the market knowledge and professional expertise that are attractive.

Although there has been growth in venture capital and angel investments, the overall availability of funding remains lower compared even to leading regional ecosystems like Baltic states. Dependence on EU and government funding, which can be inconsistent, adds to the uncertainty. The withdrawal of such funding in recent years has led to significant declines in investments (Karsai, 2023). According to Karsai, the venture capital industry is once again facing a challenging period globally. Significant state interventions due to the COVID-19 pandemic, the geopolitical shifts following the Russian invasion of Ukraine in 2022, disruptions in supply

chains, and volatility in energy, stock, and debt markets, alongside inflation and high interest rates, have all diminished the attractiveness of venture capital investments. The deteriorating investor environment is affecting the Central and Eastern European business incubation market, which is particularly vulnerable due to its geographical proximity to the Russia-Ukraine conflict. This situation encourages startups to distance themselves from the region rather than attracting talented founders and new companies from the international market, despite the area's cost advantages and abundance of skilled professionals. Consequently, despite the business incubation institutions' development in line with international trends, the region's overall prospects for continuing and deepening its integration into the global market, which began before the war, have not improved.

The positive impacts of state involvement included increased capital supply, some notable innovations, improved transparency in corporate operations, heightened activity among business angels, new market entries by funds, and greater awareness of venture capital (Karsai, 2018).

#### 3.2.3.2 Government-Backed Funding Programs

Given the context, it is unsurprising that Hiventures, the largest and most active venture capital firm, is state-owned. Hiventures offers pre-seed, seed, and growth capital, ensuring continuous support as start-ups scale. Hiventures' focus areas include the creative industries, deep tech, healthcare, agriculture, energy, and e-commerce.

Hiventures was established in 2017, uniquely combining state funding with incubation and venture capital investment. Hiventures manages several funds, including a 30 billion HUF R&D fund and a 9,4 billion HUF digital innovation fund. During its seven years of operation, Hiventures has evaluated more than 3,000 projects and made 440 investments, including 110 as a co-financer, helping approximately 250 businesses in the idea phase get started. This amounts to nearly 62 billion HUF (EUR 160 m) in investments (Hiventures, 2024). Hiventures also organizes the annual Regional Startup and Innovation Day, which is the largest start-up networking event in the region.

The Hungarian Development Bank (MFB) which is the parent company of Hiventures, offers loans, guarantees, and equity financing to support start-ups and SMEs. Specific programs target innovation and technology development, providing crucial financial support for high-potential start-ups (MFB, 2024).

The National Research, Development and Innovation Office (NKFIH) manages several funding programs aimed at promoting R&D and innovation. These include grants for research projects, funding for technology transfer, and support for international collaboration (NKFIH, 2024).

The Hungarian Investment Promotion Agency (HIPA) facilitates foreign investment and provides support for start-ups (HIPA, 2024).

Hungary benefits from various EU funding programs that support innovation and entrepreneurship. Horizon 2020, now succeeded by Horizon Europe, provides substantial grants for research and innovation projects involving Hungarian start-ups (European Commission, 2024).

#### 3.2.3.3 Private VC Funds

The Hungarian Venture Capital and Private Equity Association (HVCA), established in 1991, represents the interests of the private equity and venture capital sector in Hungary. The MKME's members include all major investors and advisors dealing with non-listed companies in the sector. As of June 2024, the Association had 24 members headquartered in Hungary, three of which were state-owned VC companies (HVCA, 2024).

Day One Capital is an early-stage venture capital firm, focusing on technology-driven start-ups with high growth potential. Day One Capital has a diversified portfolio, including investments in sectors such as AI, SaaS, and cybersecurity (Day One Capital, 2024). They typically invest €300k - €1.5M with substantial reserves for follow-on investments. Day One Capital was one of the initial investors in aiMotive, a start-up that executed the most valuable exit of 2022. The company was acquired by the Stellantis group, which includes brands such as Fiat, Chrysler, Citroën, and Maserati (Zsiborás, 2022). The Fund's other investments are Flawless, Colossyan, Shapr3D, and Webshippy (exited in 2024). They also publish the annual 'Startup salary trends in Hungary' reports.

OXO Ventures, a multi-stage venture investor and accelerator, is part of OXO Holdings, a leading investment firm in the tech sector in the CEE region. In its thesis, the firm is focused on finding technology-intensive solutions capable of shifting customer or market patterns. They invest from €200k and up to €5M. Some of the firm's portfolio companies include Evermart, zLense, and Commsignia (OXO Group, 2024).

PortfoLion Capital Partners is another key player in the Hungarian venture capital scene, providing funding and strategic support to start-ups and SMEs. Backed by OTP Group, one of the largest Banking groups in the CEE region, the fund has been actively investing in the seed stage across multiple verticals since 2010. The firm invests in various industries, with a strong emphasis on technology, digital media, and healthcare. Beyond funding, PortfoLion offers mentorship and access to a wide network of industry experts and partners. Their investment ticket is €500k - €5M. The Fund's notable investments are SEON, Commsignia, Starschema (exited in 2022), Deskbird, and FlowX.ai (PortfoLion, 2024).

Tresorit's investment journey exemplifies the typical path of successful startups: beginning with seed capital for product development, and then securing increasingly larger investments for market expansion, additional product enhancements, and human resource development. Venture capital and angel investors consistently profited by selling their shares in each funding round.

*Case Study: The Tresorit investment story*

Tresorit is a cloud-based, secure file synchronizing and collaboration software that enables business users to share confidential data with the highest level of security. Its patented end-to-end encryption service has earned accolades, such as the Gartner Peer Insights Customers' Choice Award in 2020. Tresorit's technology encrypts data before it reaches the cloud, ensuring that decryption keys never enter the cloud, adhering to a "zero knowledge" principle. Through a collaboration with Apple's healthcare team, developers can use Tresorit's patented encryption to secure iOS healthcare apps.

Founded in 2011 by István Lám, Szilveszter Szebeni, and György Szilágyi, Tresorit's roots trace back to the CrySyS Data and System Security Laboratory at the Budapest University of Technology and Economics, where Lám and Szebeni were computer

science students. They were joined by Szilágyi, a student at Corvinus University of Budapest, who contributed his expertise in economics, business, and product development.

In 2012, Tresorit closed its first investment round with €1.5 million from the VC fund Euroventures and nine angel investors, including Márton Szőke, Balázs Fejes, and Swiss businessman Andreas Kemi, who has since served as Chairman of the Board. This initial investment funded two years of product development.

Just a month after exiting beta, Tresorit secured a second round of funding, raising an additional $3 million from previous backers.

In 2017, Márton Anka, co-founder of LogMeIn, joined Tresorit as a strategic advisor and investor.

On September 4, 2018, Tresorit announced the closure of an €11.5 million Series B financing round, led by 3TS Capital Partners and joined by PortfoLion. Key existing investors, including Andreas Kemi and Márton Anka, also participated. Part of this funding facilitated the acquisition of existing shares.

In 2021, Swiss Post acquired a majority stake in Tresorit, with the founders retaining minority shares and continuing to lead the company.

#### 3.2.3.3 Angel Investment

Angel investments represent one of the first steps in financing early-stage companies and start-ups. Angel investors take significant risks by investing capital, knowledge, experience, and support in nascent companies at a very early stage. They undertake this risk – with international statistics indicating a failure rate of 80-90% – in the hope that some of the companies they finance will become rapidly growing, successful scaleups in the coming years. After a few years and considerable market and organizational development, they aim to sell their shares at substantial profits, potentially 10 or 100 times the initial investment. Angel investors play a crucial role in the early stages of a start-up's life cycle by providing not only capital but also valuable expertise and connections.

Typically, an individual angel in Hungary invests between 10,000 and 50,000 euros per investment. However, through syndicates, multiple angels combine their capital, allowing start-ups to receive between 50.000 and 300.000 euros in a single funding round.

Hungary has a growing network of angel investors who are keen to support innovative ventures. Many successful entrepreneurs and industry veterans in Hungary act as individual angel investors. They bring extensive experience, industry insights, and strategic guidance, alongside their financial investment.

The Hungarian Business Angel Network (HUNBAN) is a prominent network of angel investors in Hungary, dedicated to supporting early-stage start-ups. The network organizes pitch events, provides mentorship opportunities, and facilitates connections between start-ups and investors. HUNBAN members have invested in numerous start-ups, offering vital seed funding and helping to bridge the gap to larger investment rounds (HUNBAN, 2024).

#### 3.2.3.4 Crowdfunding Platforms

Crowdfunding has emerged as an alternative funding source for start-ups, allowing them to raise capital from a large number of small investors.

StartSomeGood is a crowdfunding platform that supports social enterprises and start-ups with a social impact focus. It allows entrepreneurs to create campaigns and attract funding from individuals interested in supporting innovative projects that address social challenges (StartSomeGood, 2024).

Global crowdfunding platforms like Indiegogo and Kickstarter are also accessible to Hungarian start-ups. These platforms offer a way for start-ups to validate their ideas, gain initial funding, and build a community of early adopters and supporters. Among Hungarian start-ups, Brewie, which manufactured home beer brewing machines, GrapeOcean Technologies, a video game developer, AIT Smart One which manufactures smart desks, Shoka Bell, the smart bicycle bell, utilized this form of financing.

We can conclude that although the number of available fundraising options for start-ups is high, there is a lack of "smart money" that could help the international growth of these companies. There should be more co-investments with international VCs and the country, and the region should attract Western EU and US investors (Startup Europe, n.d.)

### 3.2.4 Business Incubators and Accelerators

Business incubators and accelerators offer structured programs with mentoring and training for selected groups, typically culminating in a public pitch event (Cohen et al., 2019). The rise of digitalization has significantly reduced experimentation costs over the past decade, which has facilitated the emergence of these organizations (Ewans et al., 2018). This reduction in costs has lowered the seed capital requirements for start-ups, allowing incubators and accelerators to provide substantial support, often with minimal or no financing.

Discussing the significance of the ecosystem metaphor, we have already touched on the importance of cooperation among participants. Technological solutions and lessons from successful start-ups within these programs spread among other participants, making knowledge more accessible and accelerators more effective in fostering growth (Drori & Wright, 2018). Cooperation is highly valued, with many programs fostering mutual recognition and curiosity among entrepreneurs. Teams often share workspaces, participate in specialized sessions, and offer each other advice on various topics, from technology to marketing. Accelerators play a crucial role not only in developing participating start-ups but also in positively influencing the broader entrepreneurial environment.

In Hungary, the government has played an increasing role in establishing and funding incubators and accelerators. The first state incubation program, the Accredited Technology Incubator (ATI), was launched in 2013, targeting the establishment and support of four technology incubators (ACME Labs, Acquincum Technology Incubator, Digital Factory, iCatapult) with grants of 60 million HUF each. By 2014, there were 11 business and technology incubators offering office space, complex services, investment, and global networks. In late 2015, a new state incubation tender offered 600 million HUF in non-refundable support to private organizations. By 2016, eight regional and three Budapest-based accredited technology incubators received nearly 2 million EUR each (Lovas & Riz, 2016).

To further support incubators, the (former) Ministry of Innovation and Technology launched the Startup Factory program in 2020, providing 2 billion HUF to enhance risk-taking and support activities. This program selected seven organizations, each receiving 300 million HUF (Hungarian Government, 2020). The program included innovative requirements, such as a cap on incubator stakes at 24% and a stipulation that 80% of the funding must go to incubated companies. The Széchenyi Funds announced a new program in 2021, offering 10 billion HUF for incubators and accelerators, with selected applicants receiving 300 million to 1.5 billion HUF (Növekedés.hu, 2021).

In 2017, Hungary-based OTP Bank, in partnership with its subsidiary PortfoLion Venture Capital Fund Management, launched an international accelerator program for fintech start-ups. The OTP Startup (later: Booster) program, announced annually, invests in companies with growth potential and promising fintech innovations. Participants work on innovative banking test projects with mentors and experts. Since 2019, five OTP Bank Group foreign subsidiaries have joined, offering an additional six-month cooperation period for top performers. Other Hungarian banks like K&H, MKB, and CIB, as well as energy (Mol, MVM) and telecom companies, have also invested in local incubator and accelerator programs to support start-ups in their fields.

Several venture capital funds in Hungary have launched their own incubator houses and acceleration programs. For example, Traction Labs Ltd. was established by PBG FMC, the AVEC Accelerator program by the Day One Group, OXO Labs by the OXO Group, and the Startup Factory by BNL Start.

The Global Accelerator Network (GAN) is an alliance of independent accelerators, large corporations, and investors that connects start-ups with financial and human resources. They have launched programs in over 120 countries and supported more than 19,000 start-ups over ten years. In Hungary, GAN includes one banking accelerator: Start it@K&H.[10]

[10] In the region, it also includes one Bulgarian accelerator (Eleven) and two Czech accelerators (Start it@ČSOB and Startup Yard).

Other incubators include the private incubators Design Terminal, Lab.Coop, and xLabs. Impact Hub Budapest is a member of the global Impact Hub network accelerating inclusive and sustainable innovation), and NAK TechLab is the agricultural start-up program of the National Chamber of Agriculture.

*Case study: Design Terminal*[11]

Since the establishment of the first acceleration program for creative industry entrepreneurs in 2014, Design Terminal has played a pivotal role in the Hungarian and broader European start-up ecosystems, offering extensive support and resources to emerging businesses and talented individuals.

The agency's core mission is to accelerate the development of start-ups and facilitate their successful integration into the market. This is achieved through a combination of business consultations, tailored accelerator programs, and a robust network of mentors and industry experts.

Their flagship incubation initiative, the Mentoring Program, runs twice annually, during spring and fall, with each semester comprising three months of intensive mentoring. Although the Mentoring Program is not industry-specific, it is dedicated to start-ups addressing social problems, focusing on teams committed to making a positive impact on the world. Typically, around ten start-ups are selected for each cohort based on the quality of their solutions.

The Mentoring Program in Numbers:

- Over 1000 applicants
- More than 50 hours of professional programs per semester
- Over 30 hours of personalized mentoring per semester

Another Design Terminal program, Space Terminal serves as the Hungarian partner of the European Space Agency (ESA), fostering the development of successful start-ups and projects that contribute to the broader European space ecosystem and industry. They collaborate with leading Hungarian market players and institutes,

[11] Source: https://designterminal.org/en

while also expanding their network to include university students, start-ups, SMEs, R&D stakeholders, and academia.

### 3.2.5 Government Policies and Support

The Hungarian government has recognized the importance of fostering a vibrant start-up ecosystem and has implemented a variety of policies and support mechanisms to encourage entrepreneurship and innovation. These initiatives aim to provide financial support, create a conducive regulatory environment, and facilitate the growth and international expansion of start-ups.

The Hungarian government has launched several initiatives designed to bolster the start-up ecosystem. These initiatives are often coordinated through various government agencies and ministries, each focusing on different aspects of start-up support.

The Digital Welfare Program aimed to enhance digital infrastructure and literacy, promoting digital innovation across Hungary. It included measures to support digital start-ups, improve broadband connectivity, and enhance IT skills among the workforce. Two main strategies were accepted within this strategy: the Digital Export Development Strategy to enhance export by using ICT tools, and the Digital Start-up Strategy to support the creation and development of innovative start-ups with high growth potential (VV – WIK Consult, 2019).

Named after the 19th-century Hungarian chemist János Irinyi, the Irinyi Plan focuses on modernizing the Hungarian industry through innovation and technology. It provides support for industrial start-ups, particularly those involved in advanced manufacturing and technology sectors (Hungarian Government, 2016).

The Hungarian government offers several tax incentives and subsidies to reduce the financial burden on start-ups and encourage investment in innovative ventures.

Hungary offers one of the lowest corporate tax rates in Europe at 9%, which is highly favourable for start-ups. This low tax rate applies universally, making it easier for start-ups to retain more of their earnings for reinvestment and growth.

Companies investing in research and development activities can claim significant tax deductions. Both SMEs and large enterprises engaged in R&D can benefit from these credits, encouraging innovation across various sectors. Companies can reduce their tax burden by contributing to innovation funds, which are used to support R&D activities. All businesses can participate, but start-ups particularly benefit by gaining access to additional funds for their innovative projects.

The Hungarian government provides various grants and funding programs to support the development and growth of start-ups. These programs are often co-funded by the European Union, enhancing their scope and impact. We have previously discussed the programs of the Hungarian Development Bank (MFB) and the National Research, Development and Innovation Office (NKFIH).

Creating a start-up-friendly regulatory environment has been a key focus of the Hungarian government. Efforts are made to streamline bureaucratic processes and reduce administrative burdens on start-ups:

- The process for registering a new company in Hungary has been simplified and digitalized, significantly reducing the time and cost involved. This makes it easier for entrepreneurs to start their businesses and focus on growth and innovation.
- In Hungary, legislation introducing the so-called "white card" was enacted in July 2021 for those who work as digital nomads, meaning they can perform their work from anywhere in the world. The white card is available to individuals who come from outside the European Economic Area and hold employment in a non-European Union country, provided they can prove a monthly income of 2.000 euros. However, they are not required to pay income tax. Applicants must submit their request at the Hungarian embassy in their home country, and upon approval, they can enter Hungary after a 30-day waiting period. Once in the country, they must apply for the white card in person to be able to work during their stay (Hajdú, 2023).
- The government has strengthened intellectual property (IP) protections to safeguard innovations. Strong IP laws provide start-ups with the confidence to invest in new technologies and bring them to market without fear of infringement.

Recognizing the importance of global markets for start-ups, the Hungarian government provides various programs to help start-ups expand internationally. Agencies like the above-mentioned Hungarian Export Promotion Agency (HEPA) offer services to help start-ups enter foreign markets. These include market research, trade missions, and participation in international trade fairs. Programs such as V4 Startups, which foster collaboration among Visegrad Group countries (Hungary, Poland, Czech Republic, and Slovakia), provide platforms for networking and joint ventures. Start-ups benefit from shared resources, knowledge exchange, and access to regional markets.

### 3.3 Empirical Research on Survival and Growth of Hungarian Start-Ups

Radácsi and Csákné (2021) analyzed the determinants of start-up survival and growth, utilizing a systematic literature review of empirical studies and expert interviews with prominent figures in the Hungarian start-up ecosystem.

Their literature review, which incorporated studies from the Web of Science Core Collection and ScienceDirect databases, identified several factors that positively impact the survival and growth of start-ups. These factors include the following:

- Higher levels of business experience and business planning positively influence the survival and growth of start-ups.
- The choice of location, particularly proximity to important customers, suppliers, research centres, and business organizations, also plays a crucial role.
- Patent development and new technology-based firms improve survival rates, provided these firms move beyond the self-employment phase in their lifecycle.
- Entrepreneurship education positively impacts survival, while previous entrepreneurial experience does not have a significant effect. The university background of the founder(s) is beneficial for business survival.
- High absorption capacity, specific customer-supplier relationships, and internationalization enhance survival chances.
- Firms with founding members who have both academic and non-academic experience are more likely to grow compared to those started by less diverse teams. A combination of technical, managerial, and commercial experience is particularly advantageous.

- Bootstrapping, or the ability to finance growth internally from cash flow, is beneficial. However, business angels, venture capital, and traditional bank financing positively impact growth, whereas government subsidies and stock market introduction do not correlate with growth rates. External equity financing is associated with higher growth rates.

Interviews with experts from the Hungarian start-up scene revealed that the factors influencing survival and growth differ somewhat from those indicated in international literature. From among the factors influencing the survival and growth of start-up companies indicated in international literature, the authors were able to identify only four through the analysis of expert interviews: entrepreneurial education, internationalization, acquisition, and the heterogeneity of the start-up team's knowledge and skills.

The factors influencing the survival of start-ups identified in the interviews can be divided into three large groups. The first group consists of internal factors such as team weaknesses/conflicts among the founders and funding problems. The second group includes external factors, with experts noting the importance of timing and the lack of effective incubation and mentoring support. The third major group, sociocultural factors, encompasses values rooted in the past, the conflict of short-, medium-, and long-term financial goals and opportunities, and the rent-seeking attitude.

Additionally, the experts pointed out that just as professional knowledge and management skills play a key role in the survival of start-ups, the lack of knowledge and unpreparedness in the areas of entrepreneurship, finance, and management are also often barriers to the growth of start-ups.

### 3.4 Entrepreneurial Education

Entrepreneurship education and preparation for entrepreneurial careers are some of the most critical aspects of the Hungarian ecosystem.

### 3.4.1 Entrepreneurial Competence

Entrepreneurial competence is a transversal competency that applies to all areas of life, from personal development and active social engagement to entering or re-entering the labour market (whether as an employee or as an independent entrepreneur) and launching ventures representing cultural, social, or commercial value. Thus, while the components of a successful venture are complex and dynamically influenced by environmental conditions and expectations, the presence of entrepreneurial competencies provides a foundation for increasing the chances of success not only for entrepreneurs or future entrepreneurs but also for individuals in various roles within the labour market.

As the focus on competency development becomes central to learning, one of the challenges for entrepreneurship education is to move away from frontal knowledge transmission and find ways to support post-graduate success, facilitating a smooth transition between the years spent in education and the period following graduation. According to Tsankov (2017), the development of students' transversal competencies requires problem orientation, autonomy, and creativity. He notes that "the acquisition of a knowledge system for the specific and the general is a cognitive process, characterized by the continuous design of models, through which students encode, recode and decode information in the course of the incessant transition from the concrete to the abstract and vice versa" (ibid, p. 140).

The European Union Lifelong Learning Reference Framework encompasses a range of essential competencies, one of which relates to entrepreneurship competencies, which are defined as "the capacity to act upon opportunities and ideas, and to transform them into values for others. It is founded upon creativity, critical thinking and problem-solving, taking initiative and perseverance and the ability to work collaboratively to plan and manage projects that are of cultural, social or financial value" (Council of the European Union, 2018). The importance of this competence is highlighted by the creation of a separate framework for entrepreneurship (Bacigalupo et al., 2016; Rațiu et al., 2023).

The Hungarian entrepreneurship education does not fully support the comprehensive development of entrepreneurial competencies. Mihálkovné's (2014) study suggests that one contributing factor to this insufficiency could be the

interchangeability and indistinct implementation of economic knowledge, entrepreneurial knowledge, and entrepreneurial competencies.

### 3.4.2 GEM Data

As mentioned earlier, the Global Entrepreneurship Monitor (GEM) expert panel highlights a significant lag in entrepreneurial education at both primary and higher education levels (Csákné et al., 2022; 2023; 2024).

Since 2021, the proportion of the Hungarian population aged 18-64 who self-report possessing the knowledge, skills, and experience necessary to start a business has been slowly but steadily increasing, according to GEM data. However, this proportion remains the lowest among the European Union countries participating in the GEM research. In 2023, the proportion was 38,3%, significantly below both the EU average and the average of Central and Eastern European EU member states with similar socio-cultural and historical backgrounds.

GEM data also indicates that 16,2% of the Hungarian adult population received some form of education or training that prepares and motivates them for entrepreneurship, which is nearly identical to the 18,1% measured in the previous year. There is no significant change in the fact that the majority (52,0%) acquired this knowledge through non-formal training or courses. Additionally, a quarter (25,4%) of those who received entrepreneurial education did so at a university, and one-fifth (20,3%) received it in high school. The role of primary school in acquiring entrepreneurial knowledge was negligible in both years.

Furthermore, seven out of ten entrepreneurs started and ran their businesses without ever participating in entrepreneurship education, likely negatively impacting their operational efficiency and competitiveness. There is a strong correlation between being an entrepreneur and participating in entrepreneurship education; those who own businesses are nearly twice as likely to have received entrepreneurship education compared to non-entrepreneurs.

### 3.4.3 GUESSS Data

Hungary has participated in seven surveys of the GUESSS (Global University Entrepreneurial Spirit Students' Survey), a biennial survey conducted since 2003. The data presented in Figure 4 represents the percentage of students inclined towards pursuing an entrepreneurial career immediately after completing their studies, as well as the aspirations five years down the line (Gubik & Farkas, 2022).

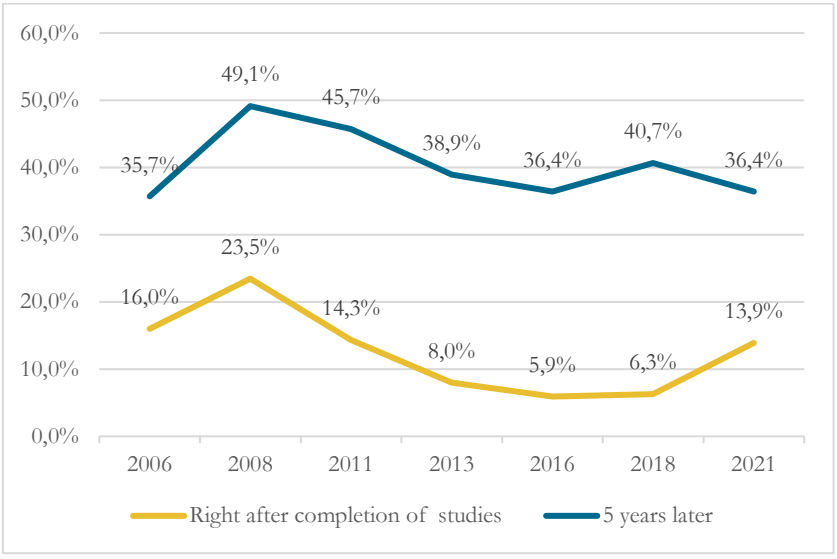


**Figure 4: Entrepreneurial career plans 2006-2021 – Hungarian results from the GUESSS 2006, 2008, 2011, 2013, 2016, 2018, and 2021 databases**
Source: Reproduced from Gubik & Farkas, 2022, p 14, with permission

The initial benchmark in 2006 stood at 16%. Subsequently, a notable rise occurred in 2008, which was then followed by a considerable decline, likely attributed to the impact of the financial crisis. By 2018, there was a slight improvement in the ratio, and a substantial amelioration was observed in 2021. These figures, though lower than global averages, still surpass the data from countries with the highest GDP.

*Case study: Hungarian Startup University Program*

The most recent development in the Hungarian entrepreneurship education ecosystem was the launch of the Hungarian Start-up University Program (HSUP) in 2020. The two-semester-long e-learning programme was initiated and centrally

administered by the Hungarian National Council for Research, Development and Innovation (NKFIH) to familiarise students in the higher education system with ideas and concepts concerning innovation, financial planning, market strategies, and IP rights. HSUP provides a comprehensive curriculum that combines theoretical knowledge with practical experience to cultivate the next generation of entrepreneurs. Since its first year, the programme has been running at more than 30 Hungarian higher educational institutions (HEIs), and the number of participants reached 4.200 in the 2023/2024 academic year.

HSUP is structured to offer a balanced mix of online courses, workshops, and hands-on projects. The program spans two semesters:

- First semester: Foundational knowledge (Students learn the basics of entrepreneurship, including business planning, market research, financial management, and legal aspects of starting a business.)
- Second semester: Practical application (Project Development: Students form teams to develop their start-up ideas, applying the knowledge gained in the first semester. Mentorship: Each team is assigned a mentor from the business community to provide guidance and support throughout the project.

At the end of the semester, teams present their projects to a panel of judges, including investors and industry leaders, with opportunities for funding and further development.

Key features of the programme:

- HSUP is open to students from all Hungarian HEIs, ensuring widespread access to entrepreneurial education.
- The program encourages students from diverse academic backgrounds to participate, fostering interdisciplinary collaboration and innovation.
- HSUP integrates various stakeholders, including universities, businesses, and government bodies, to create a supportive ecosystem for aspiring entrepreneurs.

Since its inception, HSUP has made significant strides in promoting entrepreneurship among Hungarian youth:

- Over 14,000 students from 33 universities have enrolled in the program, indicating strong interest and engagement across the country.
- The program has facilitated the creation of numerous start-ups, with several student projects securing funding and mentorship for further development.
- Participants report enhanced entrepreneurial skills, increased confidence, and a better understanding of the start-up ecosystem.

A study summarizing the experiences from the first years of the Hungarian Startup University Program (HSUP) found that teams with members from multiple universities possessing engineering and IT competencies are more likely to advance their projects (Dőry et al., 2024). Additionally, an indicator of the intention to continue can be the team's more active development activities during the semester, such as demonstrating the functionality of the technological solution or creating an MVP. The success of initial student projects is also facilitated by diversity; teams with an institutionally heterogeneous composition are more likely to continue their work. Although the proportion of team members with engineering competencies is low, those teams with such members are more likely to complete the MVP and plan to continue the project.

While HSUP has achieved considerable success, it faces challenges such as scalability (expanding the program to include more students and universities while maintaining quality), and sustained funding.

## 3.5 ICT Talent Pool, STE(A)M Education, Digital Competences[12]

### 3.5.1 ICT Workforce

Hungary has the region's highest share of ICT (information and communication technology) specialists in the workforce (3.9%) but it remains below the EU average (4.5%) (European Commission, 2022).[13] According to a Dealroom analysis, because

[12] The "A" in "STE(A)M" stands for Arts. Incorporating the arts into the traditional STEM (Science, Technology, Engineering, and Mathematics) framework aims to foster creativity and innovation. The inclusion of the arts encourages a more holistic approach to education, promoting critical thinking, problem-solving, and collaboration. It emphasizes the importance of creativity and design in technical fields, helping students to develop a more comprehensive understanding of how various disciplines interconnect and contribute to solving complex, real-world problems.

[13] The combined share of Germany, France and Italy accounted for more than 40% of the EU's ICT workforce.

of the strong STE(A)M (science, technology, engineering, arts, mathematics) education and world-class technical talent pool, the verticals where Hungary tends to produce most of the success stories lay in deep tech-related verticals such as data analytics and data science, artificial intelligence, and cybersecurity. Hungarian start-ups in the field of fintech and blockchain have shown great development over the last few years (Dealroom, 2022b).[14]

Some of the most successful companies raise money and open headquarters in the US, but they keep most of their R&D activities and tech teams in Hungary. In recent years some of the fastest-growing international tech companies such as Cloudera, Tansferwise or Blackrock opened large development offices in Hungary to utilize the great STE(A)M talent pool of Hungary (Startup Europe, n.d.).

However, one of the largest challenges for start-ups is to find a skilled workforce as the digital industry is rapidly growing in Hungary. Although one of the main strengths of the ecosystem is the quality of the technical talent, the labour market is limited and approximately 22.000 people are missing from the IT industry (Startup Europe, n.d.). Multiple coding schools are popping up, trying to solve this gap. Also, many companies manage to attract people from other countries to relocate to Budapest. Besides the limited number of engineers, the ecosystem lacks the marketing and business competencies needed for scale-ups. This is why successful start-ups started in Hungary are often headquartered in the US (ibid.).

### 3.5.2 STE(A)M Education

Due to these issues, Hungary's government aims to increase university enrollment in science, technology, engineering, and mathematics programs to 50% by 2030 (BBJ, 2023), and it implemented various programs in both secondary and vocational education systems.

[14] A good example of the "internal migration" of essential professionals necessary for the development of the start-up ecosystem is the case of one of the earliest Hungarian start-ups. The adult streaming site LiveJasmin, which is often overlooked by the tech community due to the risqué industry it works in, was founded in 2001, and became one of the most popular adult sites in the world around 2004. To this day, it continues to be leading stream and chat site. The founder, György Gattyán, was named No. 1 on the Forbes Hungary's 'Richest Hungarians' list in 2014. Many of the engineers who would then move to Ustream began working in streaming with LiveJasmin. As we mentioned it earlier, on January 21, 2016, IBM acquired Ustream for up to $150 million.

In 2020, the "Vocational Training 4.0" strategy was introduced, targeting the vocational education system, which encompasses approximately 400 schools nationwide. This strategy aims to ensure that all aspects of vocational education are aligned with the challenges posed by Industry 4.0. Sectoral Skills Councils, composed of top-tier employers from various sectors, have been established to align vocational training with current market demands. Within the Vocational Training Centers, Digital Community Maker Spaces were established (Halaska, 2024). These Maker Spaces, equipped with state-of-the-art instruments and machinery, host both curricular and extracurricular activities, workshops, competitions, and camps for interested individuals. These activities allow participants to explore technologies such as 3D printing, laser cutting, CNC machining, welding simulators, and mobile-controlled robots. The Maker Spaces emphasize student creativity, with participants actively engaging in the creative process rather than merely observing. Through collaborative team efforts and playful environments, participants can familiarize themselves with both traditional and modern tools and technologies, while also enhancing their professional knowledge and skills (ibid.).

*Case study: KIKS – Kids Inspiring Kids in STEAM*

With professional support from the Hungarian Association for Digital Education, the international educational project KIKS[15] – Kids Inspiring Kids in STEAM – was conducted. This Erasmus+ initiative involved children from four European countries (Hungary, Finland, Spain, UK) collaborating virtually through Facebook and other Web 2.0 tools. The project's goal was to demonstrate the appeal and excitement of STEAM subjects through student-created projects.

Besides fostering interest in STEAM subjects, the KIKS project aimed to enhance students' independent learning abilities and develop their self-motivation and peer motivation skills. Virtual group work, online communication, and the use of the English language provided an engaging experience, serving as an initial step towards international mobility for the participants.

In Hungary, 50 students from six institutions participated in the program, with each school represented by a team of at least four students and a mentor teacher. Similar team compositions were present in other participating countries. Initially, these local

[15] The case study is based on the Hungarian Association for Digital Education's project description: https://mdoe.hu/projektek/kiks-kids-inspiring-kids-in-steam/ and on Fenyvesi et al, 2017.

teams planned and executed projects, involving their school and local communities. The only requirement set by the organizers was that the project should integrate mathematics with at least one other science subject and connect to the arts in some way. At the end of this phase, each group presented their project, and the best ideas were further developed by international teams. After five weeks of online collaboration under the guidance of mentor teachers, the mixed teams presented their final projects to an international jury. All international projects were showcased at the KIKS stand during the 2017 Cambridge Science Festival.

The Hungarian Association for Digital Education compiled the valuable experiences and insights gained from the KIKS project into a handbook for educators.

Naturally, it will take many years to determine whether these programs will have any impact on the development of the Hungarian start-up ecosystem. However, it can be confidently stated that the enhancement of skills and competencies, in addition to knowledge transfer—based on what has been described regarding entrepreneurial training—is certainly a welcome development.

### 3.5.3 Digital Literacy

The European Commission has been monitoring Member States' digital progress through the Digital Economy and Society Index (DESI) reports since 2014. The latest DESI report is from 2022, and it is based mainly on 2021 data (European Commission, 2022).

Hungary traditionally performs best in the area of digital infrastructure, ranking 13th, which places it in the middle of the EU pack. Neither internet access nor the prevalence of internet usage can now hinder digital convergence. However, the country lags significantly in digital literacy, ranking 23rd.[16] Hungary has fallen behind not only the traditionally better-performing Scandinavian countries and the EU average but also the average of the Visegrad region. Only 49 per cent of Hungarians have at least basic digital skills. Digital inequalities overlap with general social

[16] Besides digital literacy, the most significant lag is in the digitalization of companies, ranking 25th, which causes severe competitiveness disadvantages. Only one-third of Hungarian SMEs have at least basic digital intensity, and two-thirds do not even have a website. The proportion of companies using artificial intelligence (3 %) and big data applications (7 %) is minimal, and the rate of cloud service subscriptions (24 percent) is well below the EU average. In terms of digital public services, Hungary ranks 21st within the EU.

disparities: the digital divide primarily affects the poor, the less educated, those living in underdeveloped regions, and the elderly.

The weakness in digital competencies can primarily be attributed to deficiencies in the education system. Beyond the general issues affecting the public education system, specific problems at all levels of training and education also contribute to the inadequacy of digital competencies (DJP, 2016).

## 4 Potential Benefits and Challenges for the Hungarian Start-up Ecosystem

### 4.1 Potential Benefits of a Better Ecosystem

A team of analysts from McKinsey suggest that over the coming decade, a more advanced start-up ecosystem could significantly benefit Hungary's economy in three ways (Havas et al., 2023).

1. Economic and financial value added: Maturity in the start-up funding funnel could generate EUR 2.5 billion–EUR 5.0 billion in additional sector funding, with EUR 0.6 billion–EUR 1.3 billion contributing to local economic spending. This job creation could yield up to EUR 2.2 billion in employment taxes between 2025 and 2030, alongside other tax revenue increases.
2. Talent development: A more advanced start-up ecosystem could create nearly 30,000 high-value jobs in Hungary, providing opportunities for local professionals and attracting skilled labour from abroad. This effect is particularly pronounced in digital start-ups, benefiting the economy at large.
3. Digitalisation: A McKinsey report (2022) highlights that an advanced start-up ecosystem, focusing on digital solutions, could enhance nationwide digitalisation, potentially adding EUR 9 billion to GDP by 2025. The authors concur with Torres and Godinho (2021) that ambitious firms are essential for competitiveness, and a digital entrepreneurial ecosystem can cultivate digital unicorns. This ecosystem can also rejuvenate traditional industries by enabling them to adopt cutting-edge technologies through collaborations with local start-ups.

Havas et al. further note that a successful start-up ecosystem is sustainable, with successful founders reinvesting and sharing their knowledge with new start-ups.

### 4.2 The Challenges Facing the Hungarian Start-up Ecosystem

The Hungarian start-up ecosystem faces several hurdles that could impede its future development. The key challenges include access to funding, entrepreneurial education, cultural and societal attitudes, regulatory and bureaucratic challenges, talent retention and development.

As previously discussed, while there has been some growth in venture capital and angel investments, the overall availability of funding in Hungary remains comparatively low, even when contrasted with leading regional ecosystems such as the Baltic states. Global and international funds seldom maintain a local presence and are infrequently involved in transactions within Hungary. Regional funds, although generally more locally active, typically manage transaction processes from other venture capital hubs. Furthermore, reliance on EU and government funding, which can be inconsistent, exacerbates this uncertainty.

The GEM reports indicate that Hungary lags in providing adequate entrepreneurial education and training, which affects the readiness of potential entrepreneurs. Most entrepreneurs operate without formal entrepreneurial education, impacting their efficiency and competitiveness.

There is a noticeable societal lack of trust and cooperation, which is more pronounced in Hungary and other Central and Eastern European countries compared to Western Europe. This cultural divide can hinder collaborative efforts crucial for start-up success. The perception of entrepreneurship as a desirable career option is relatively low, which can discourage potential entrepreneurs from pursuing start-up ventures.

Navigating regulatory requirements and bureaucratic hurdles can be cumbersome for start-ups. Although there have been improvements, the regulatory environment still poses challenges that can stifle start-up growth.

There is a continuous challenge in retaining skilled talent within Hungary. Many highly skilled individuals seek opportunities abroad, where they perceive better support and growth prospects. The local talent pool needs to be developed further to meet the specific needs of high-tech and innovative start-ups. Particular emphasis must be placed on STEM education to ensure that the country does not lose this

competitive advantage. The development of the digital ecosystem requires users and employees who are adequately equipped with digital skills, highlighting the importance of widespread digital preparedness. Enhancing digital skills is essential across all segments of the population.

## 5 Conclusion

The future development of the Hungarian start-up ecosystem hinges on addressing existing hurdles while simultaneously leveraging its inherent potential. To achieve this, a concerted effort from multiple stakeholders is essential and requires a holistic and integrated approach. Through the combined efforts of policymakers, educational institutions, investors, and the start-up community, Hungary can develop a more supportive and dynamic ecosystem. This will not only spur the growth of new enterprises but also contribute to the broader economic development of the country, positioning Hungary as a competitive player in the global innovation landscape.

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