

SAPIE REPORT

**Looking Back and
Thinking Forward**

sapie ▶



The Slovak Alliance for Innovation Economy

HubHub Twin City C
Mlynské nivy 16
811 09 Bratislava

info@sapie.sk
+421(904)898 403

www.sapie.sk

OUR MISSION

SAPIE acts as an independent and non-profit platform whose mission is to empower the Slovak innovation ecosystem. Being the largest professional association for innovations representing almost 200 member companies and organizations, SAPIE is also a leading platform for policy debate on digital economy and innovation in Slovakia aspiring to unite leaders within the CEE region. It is active in forming collaborative networks of private and public actors, supporting the startup scene and community and enhancing digital transformation of SMEs within the CEE region.



30 YEARS OF INNOVATIONS IN SLOVAKIA



**MICHAL
KARDOŠ**
EXECUTIVE DIRECTOR,
SAPIE

This report aims to map Slovakia's path on the digital innovation journey during the 30 years of its independent existence, as well as to offer a vision of its future development in this area. During the past three decades, Slovakia evolved from a country that former U.S. Secretary of State Madeleine Albright described as the "black hole of Europe" back in 1997, to a country which is competitive thanks to its educated workforce and has been the world's largest producer of cars per capita since 2007.

The goal of this report is not to offer a comprehensive in-depth analysis of the Slovak economy as a whole, or of its digital components. Instead, it emphasizes the progress Slovakia has made in the area of digital innovation, as well as the challenges which prevent it from realizing its potential fully. It presents selected data that illustrate the evolution of the innovation

environment and point to those areas which require urgent attention and action. To complement the data, we also included brief interviews with some of the key figures of the local ecosystem.

We believe that to remain globally competitive and to strengthen brand Slovakia in the upcoming years, a digital transformation of the economy is inevitable. Some Slovak companies have already demonstrated that it is possible to have global aspirations, and succeed.

We hope that this report will serve as a reminder of what has already been achieved, but, above all, as an inspiration for a vision of Slovakia as a modern country, fully embracing the potential of digital technology, an attractive destination for foreign investors, but also local and international talent.



STARTUP ECOSYSTEM

After its humble but enthusiastic beginnings, the Slovak startup scene has evolved and each year brings more and more inspiring success stories. The local startup scene is still relatively small even in comparison with neighboring countries and the same is true for the volume of funds invested in startups. However, numerous Slovak startups seem poised for global success and notable exits from the last few years are fueling their ambitions. The

ecosystem remains fractured, but various initiatives aimed at strengthening the cooperation between the private and public sector are pushing it in the right direction. Slovakia is still waiting for its first unicorn but it is on the right track and it may be only a few more success stories away from overcoming the existing challenges and bringing its entire innovation ecosystem to a new level.

Comparison: Slovakia vs. Estonia

Source: Central and Eastern European startups (Dealroom, Atomico, Google for startups)

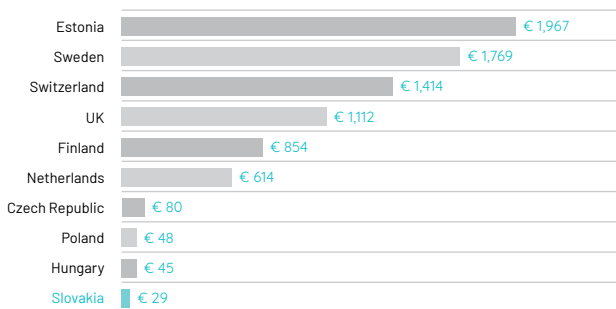
Estimated amount of investments in startups in 2021:

ca. 100 million EUR
Slovakia

ca. 1 billion EUR
Estonia

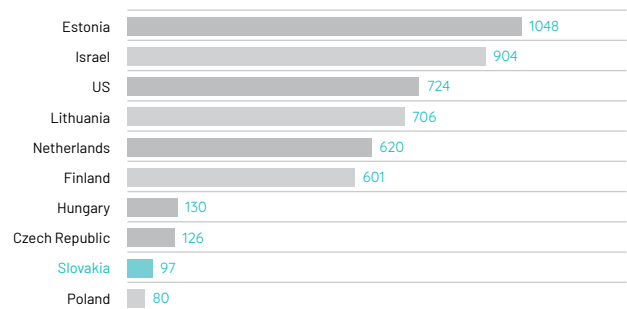
Venture capital funding, (per capita, EUR)

Source: Central and Eastern European startups (Dealroom, Atomico, Google for startups)



Startups, (per 1 million inhabitants)

Source: Central and Eastern European startups (Dealroom, Atomico, Google for startups)



.CHALLENGE

Although the Slovak startup scene is on the rise and there is every reason to be optimistic, it is also true that it continues to lag behind in several critically important aspects, both regionally and globally. In order to reach their full potential, Slovak startups can't rely solely on talent, creativity and energy. The ecosystem needs to be more developed, interconnected and stable, and provide clear guidance, financing options, and attract more talent.

The good news is that this challenge is addressed by various initiatives. Innovate Slovakia, created by SAPIE in collaboration with Civitta, is a great example of how to make the ecosystem more organized, efficient and collaborative. This platform offers specific and complex advice and information to entrepreneurs at various stages of business development, connects stakeholders to strengthen the community and monitors and collects data about the ecosystem to attract more talent and resources from abroad.



DUŠAN DUFFEK
PARTNER
& CO-FOUNDER AT
0100 VENTURES

What is the key positive change you have observed within the Slovak startup ecosystem over the past few years?

A more extensive experience of the startup founders led to more mature startups and overall ecosystem growth. Two factors are behind it. Some founders launched their second or third companies while having lived through the ups and downs of their previous businesses. Moreover, entrepreneurs returning from abroad brought their experience and network with them.

Where do you see Slovakia's biggest innovation potential?

In the combination of what we have and what the world needs. Innovation always needs to address the real problem, it needs to be unique, and it needs to be monetizable. We should focus on the low-hanging fruit, which we can scale and monetize by leveraging our existing infrastructure fast (including our bespoke automotive industry) while positioning ourselves as a world pioneer. A few topics come to mind, such as conversational AI, augmented reality, and gaming.

What one single event/change could have the biggest positive impact on the Slovak startup ecosystem?

Opening up to the world! We need diversity: otherwise, we will never be able to compete with other countries, not even those from our region.

INNOVATION ALWAYS NEEDS TO ADDRESS THE REAL PROBLEM, IT NEEDS TO BE UNIQUE, AND IT NEEDS TO BE MONETIZABLE.

DUŠAN DUFFEK



IVAN FILUS
INNOVATION &
GROWTH ADVISOR,
ENTERPRISE
EUROPE NETWORK,
HORIZON EUROPE
NCP EIC/EIE

What is the key positive change you have observed within the Slovak startup ecosystem over the past few years?

The national financial instruments for Slovak deep-tech startups linked to the European Innovation Council. Thanks to them, more than 50 Slovak startups conducted technical and commercial feasibility studies and prepared documents for one of the EIC calls. Subsequent financial support from the Ministry of Economy to 18 Slovak companies (in the range of €1-2.5 million per project) enabled them to develop their breakthrough innovations, validate them with customers and help them prepare for market entry. Despite the relatively complex project administration, Slovakia is one of the few countries in the EU that has managed to set up a similar program, enabling startups to develop products for the market and prepare for the next investment rounds.

Where do you see Slovakia's biggest innovation potential?

I see Slovakia's greatest innovation potential in the founders of new startups. Human capital is at the heart of the development of the innovation ecosystem and an important factor in attracting investment.

What one single event/change could have the biggest positive impact on the Slovak startup ecosystem?

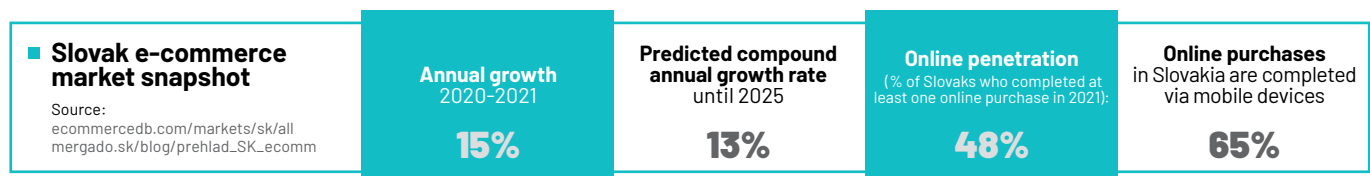
Slovakia is one of the countries with the lowest number of startups per capita in Europe, which also means a lower number of investment opportunities. If I had to choose just one measure to support the startup ecosystem, it would be the promotion of (startup) entrepreneurship at various levels of education, research and society. The education and subsequent support of new entrepreneurs is one of the main conditions for the development of an ecosystem leading to a higher number of quality startups and attracting investment capital.



E-COMMERCE

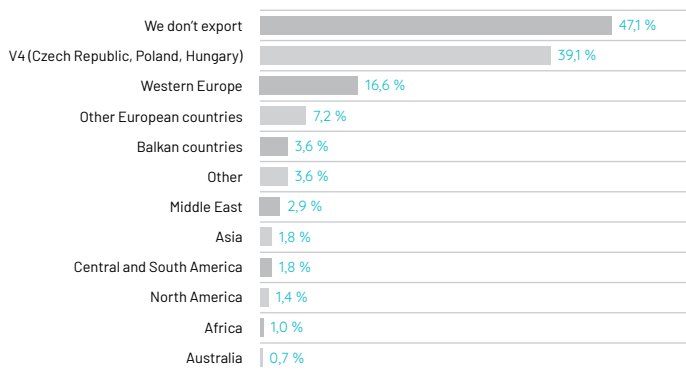
The Covid-19 pandemic and its implications for retail boosted digitalization worldwide. Slovakia was no exception, as businesses were forced to adapt their strategy to the pandemic situation. Innovative digital solutions and online sales channels were no longer a bold fantasy but a necessity to survive. This trend contributed to the ongoing growth of digital economy in Slovakia and in the region. Digital

commerce in Slovakia is strongly export-oriented and the biggest local e-commerce players are naturally looking to expand their business in the region. As the success stories confirm, the recipe for expansion includes careful planning, a well thought-out strategy, innovative solutions and products, excellent communication and a strong brand.



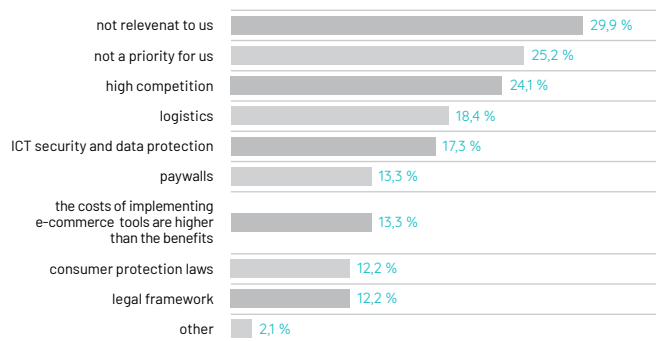
Where do you export your products and services?

Source: League for Digital Boost & Slovenská sporiteľňa SME survey (2/2023)



What are the biggest e-commerce challenges?

Source: League for Digital Boost & Slovenská sporiteľňa SME survey (2/2023)



CHALLENGE

The Slovak e-commerce market is small, compact, with high internet and social media penetration and a growing usage of mobile devices. Although the fast growth of the sector caused by the Covid-19 pandemic has halted, there are no doubts that the potential for further growth remains strong. After having established a strong position in Slovakia, local e-commerce businesses face the challenge of expanding their customer base abroad. This requires a careful analysis of the online environment in other countries and becoming familiar with their specifics (legal environment, customer behavior, main competitors, etc.). To increase efficiency, automatization of

processes and implementation of innovative solutions based on AI can play a crucial role.

The League for Digital Boost, a brainchild of SAPIE, helps SMEs grasp the huge benefits and the complexity of digitalization, and helps them find the best partners in the public sector to make their digital transition as smooth and successful as possible.

HOPERO, a European Digital Innovation Hub (EDIH) with a mission to upgrade companies and their people for the digital era, also offers expert assistance for businesses looking to expand to foreign markets.



**PAVOL
ADAMČÁK**
CEO,
DEXFINITY



**ZDENKO
HOSČEK**
CEO AND OWNER,
ZLAVADŇA

What could help more Slovak e-commerce companies expand and succeed in other markets?

The most crucial factor is to learn to dream big. We are a small nation that needs to start believing again that we can do great things for the whole world. Studying Baťa brothers and M.R. Štefánik stories can help us rediscover that “we” have once already done it. The ability to turn our constraints, e.g. “incomplete highways”, into business drivers to maximize our excellent “internet highways” for e-commerce or SaaS businesses. We need to encourage this kind of “glass is half full, not half empty” thinking. Finally, we need to travel more. Study abroad more. Exchange ideas with the world.

How is innovation helping Slovak e-commerce overcome the limitations of a small national market?

The most overlooked factor of success in international business is the ability to truly localize. A major barrier is language and local support. Innovations in machine translation, chatbots, customer service bots and AI are making localization cheaper and better.

The Google Ads and Meta (Facebook) platform technology enable you to efficiently reach customers globally. Social media like TikTok give you a new “voice” and space to educate about your products with no limits. You can open your website store on Shopify or WIX without any “code” experience. Local and Global marketplaces (Amazon) allow you to test your product on millions of customers even without your own website.

**WE ARE
A SMALL
NATION
THAT NEEDS
TO START
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DO GREAT
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THE WHOLE
WORLD.**

PAVOL ADAMČÁK

What could help more Slovak e-commerce companies expand and succeed in other markets?

Originality! To offer fresh, new, innovative and original products or services. So before expanding to other markets, I would invest in the development and evolution of the product to a level where you are ahead of the competition and closer to what the customers want, making them more happy and satisfied. Such a product or service makes the entire process of expansion much smoother and more successful.

How is innovation helping Slovak e-commerce overcome the limitations of a small national market?

Actually, innovation is the only way... A small market gives you a global mindset. And to succeed in global competition, you have to be innovative.

**A SMALL
MARKET
GIVES YOU
A GLOBAL
MINDSET.**

ZDENKO HOSČEK



DIGITAL SKILLS

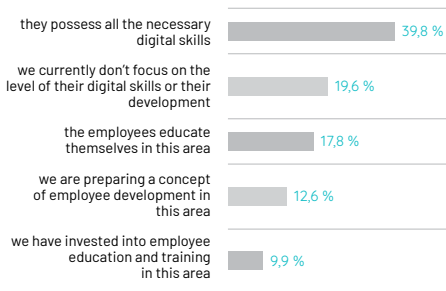
The Digital Economy and Society Index 2022 ranked Slovakia 23rd out of 27 EU member states. Slovakia has also been evaluated as the most vulnerable OECD country in terms of potential job loss due to automation and industry 4.0 transformation. SMEs form the backbone of the Slovak economy both in terms of jobs provided and value-added.

The importance of digital skills in the labor market continues to rise and companies can't afford to ignore the digital revolution if they want to thrive. Taking full advantage of the opportunities the digital world offers requires a different approach to the digital agenda in various areas.



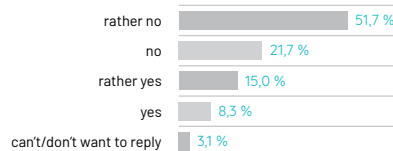
Do your employees possess basic digital skills?

Source: League for Digital Boost & Slovenská sporiteľňa SME survey (2/2023)



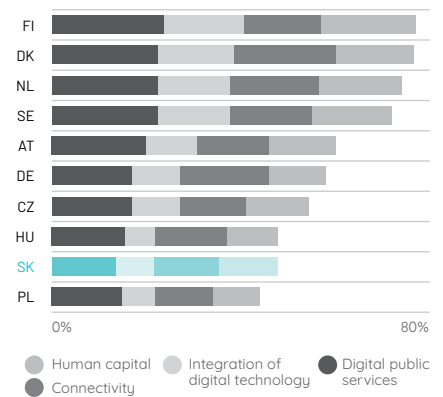
Do you have enough information about the available support for SME digitalization?

Source: League for Digital Boost & Slovenská sporiteľňa SME survey (2/2023)



Digital Economy and Society Index (DESI) 2022 ranking

Source: digital-strategy.ec.europa.eu



CHALLENGE

The challenge facing Slovakia is a difficult one but at least it's very clear - catching up with other EU members in terms of digitalization. To stay competitive, Slovakia needs to transform its economy to be more diversified, resilient and digital, and provide more support for digital skills, lifelong learning and research. The fact that 2023 was designated as the European Year of Skills should bring more opportunities and attention to make progress in these areas.

The education system should reflect the needs of the labor market and the trends that are shaping it. The pace of adoption of digital technologies especially by SMEs has to increase. The League for Digital Boost is pursuing both of these goals as it aims to connect key stakeholders from the public and the private sector across the CEE region to boost the digitalization of SMEs.



MARTIN MAŠTALÍR
GENERAL
MANAGER,
DELL
TECHNOLOGIES



TERÉZIA DOMINIKA LUKÁČOVÁ
CO-FOUNDER
& ADVISOR,
DÁ SA TO ACADEMY

What is the single most important change that could help boost digitalization in Slovak SMEs?

I consider maintenance of continuity to be one of the key conditions that must be changed for progress in digitization, and not only within SMEs. The digitalization plan should consider the real trends and needs of the country in the context of the EU. The trends are already given, and the digitalization plan should be superior to political decisions. The re-production of new plans and strategies with each change significantly slows down progress and reduces Slovakia's competitiveness. SME is a key sector of the economy and employment, and now it is necessary to focus on the implementation of strategies and their subsequent evaluation.

How can the adoption of digital technologies help SMEs adapt to the demands of the global economy?

The adaptation of digital technologies also means the strengthening of digital skills, which are essential for digitization as such. The pace of innovation is accelerating, and every company today is automatically an IT company, because digitization, data handling and the use of ICT are now part of any business. Without adapting digital technologies and skills, Slovakia will not be able to maintain its competitiveness in the long term, and we are already significantly behind other countries.

THE PACE OF INNOVATION IS ACCELERATING, AND EVERY COMPANY TODAY IS AUTOMATICALLY AN IT COMPANY, BECAUSE DIGITIZATION, DATA HANDLING AND THE USE OF ICT ARE NOW PART OF ANY BUSINESS.

MARTIN MAŠTALÍR

What are the skills that will be most important to succeed in the labor market in the upcoming years?

The Applied Educational System identified twelve skills people need in today's world, and education systems should develop them. These skills are divided into three categories: Learning skills - develop mental resilience, creativity, and the ability to adapt to the challenges of the digital world; Literacy skills - focus on developing the skills to distinguish between facts and conspiracies, reading comprehension and the impact of technology; and Life experiences - help a person be efficient and satisfied in their professional and private life. On the basis of these skills, we also develop our students and we perceive that resilience, collaboration, responsibility, digital literacy or engagement together with character, are essential pillars for the 21st century.

I FIRMLY BELIEVE THAT SLOVAKS ARE AND WANT TO BE INNOVATIVE, COMMITTED AND ENTERPRISING.

TERÉZIA LUKÁČOVÁ

What are the best characteristics of the Slovak labor force?

I firmly believe that Slovaks are and want to be innovative, committed and enterprising. I believe that we realize that the skills of the 21st century, the connection with practice, and the development of innovative education and ecosystem are essential and necessary parts for the development of Slovakia.

SMART CITIES

The continuing urbanization along with major technological and environmental changes drive a strong demand to improve urban life in areas such as transportation, energy management, safety, waste management, public services, or the overall life quality. The smart city concept offers sustainable solutions to these challenges based on better use of digital technologies and the resulting data.

The topic of smart cities is a priority of the entire European Union as is evident from the 2021-2027 EU cohesion policy. In Slovakia, the government-

approved "Program Slovakia 2022-2027" also puts special emphasis on the development and implementation of smart city solutions. The topic is further developed within the "Smart Cities and Regions Action Plan for 2023-2025", clearly defining the strategic priorities, relevant stakeholders, as well as funding opportunities. Cities and municipalities will be more empowered to allocate the available funds in line with their own strategic plans, which opens up opportunities for closer cooperation with private companies working on innovative smart city solutions.

Slovak population living in cities
2021

54%

Europe's level of urbanization is expected to increase
in 2050

83.7%

European smart cities market accounted for
in 2019

\$183.6 billion

Annual growth of European smart cities market
2020-2030

16.8%

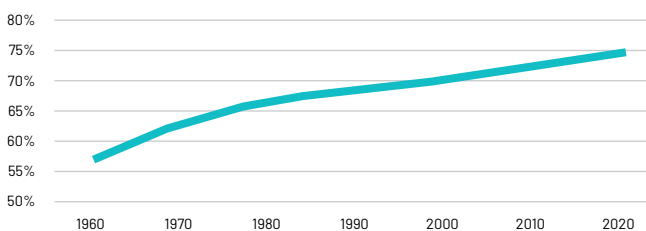
Source: knowledge4policy.ec.europa.eu

Source: researchandmarkets.com

Source: researchandmarkets.com

■ EU population living in cities (evolution over time)

Source: data.worldbank.org



■ How are cities embracing smart solutions today?

Source: 'Fit for the Future' Cities Report, September 2022, Vodafone

88%

of cities have started their digital transformation journey

72%

believe that smart initiatives have been successful in meeting policy objectives

69%

of cities plan to invest in smart solutions in the next three years

52%

of cities planning to invest in smart solutions

CHALLENGE

As national and European priorities align, the next few years present a unique opportunity to considerably upgrade Slovak cities and take full advantage of innovative solutions to make their functioning more sustainable and efficient. In order to succeed, the decision makers at all levels should be familiar with the available opportunities, the overall strategy, as well as with lessons and case studies from other cities. Making

this information available and communicating it to all involved stakeholders will be of crucial importance.

European Digital Innovation Hubs (EDIHs) such as Hopero are among those actors who are able to provide expert assistance with digitalization and smart city initiatives to the interested cities and municipalities.



PETER BALÍK
DIRECTOR GENERAL
AT MINISTRY OF
INVESTMENTS,
REGIONAL
DEVELOPMENT AND
INFORMATIZATION



PETRA DŽUROVČINOVÁ
CHIEF INNOVATION
OFFICER, CITY OF
BRATISLAVA

What is the vision for Slovakia's implementation of smart city solutions in the next few years?

The vision of the Slovak Republic is to build cities and regions, which by implementing intelligent solutions (such as data platforms, living labs, IoT sensors, property & facility management, distributed ledgers, etc.) will be able to increase the effectiveness of public processes and the quality of life of the citizens. Thanks to intelligent solutions, local governments will be able to flexibly react to challenges and mitigate risks in the future. Our Ministry has prepared a set of measures and a toolkit for the implementation of these solutions to the Slovak municipalities with a dedicated allocation of European Structural and Investment Funds.

Where do you see the biggest potential and what presents the greatest challenges?

Smart cities and regions in Slovakia create a potential to develop cooperation between our Ministry as the national coordinator of the agenda and actors at the regional and local level. The biggest challenges we are currently facing at the local level are environmental risks; limited collection, sharing and utilization of data; lack of qualified human resources and of a reflection of the needs of citizens, who are not sufficiently engaged in the decision-making. The solutions to these challenges relate to the long-term support of green sustainability measures and innovative governance processes, which are among the priorities that our Ministry aims to support.

THANKS TO INTELLIGENT SOLUTIONS, LOCAL GOVERNMENTS WILL BE ABLE TO FLEXIBLY REACT TO CHALLENGES AND MITIGATE RISKS IN THE FUTURE.

PETER BALÍK

What are the key elements of your city's smart city strategy?

Bratislava is focusing on digital innovation and improving the citizen's experience. At the end of the day, we are all public servants. One of our main goals is to build services around the needs of users, co-create together, test and then develop.

We are thinking big and starting small. With every digital pilot we have been running in the past three years, we have learned a little more about what works. The vision is to create the Bratislava ID - one account connecting all services provided by the city. The platform will be inclusive, accessible from all devices, simple and fast. From paying your property tax in minutes to buying a swimming pool ticket in seconds and submitting all requests digitally.

Which goals do you hope to achieve in the next few years?

We believe we need a set of skills and an innovative mindset allowing us to experiment, test, measure and fail or succeed. Cooperation across domains will be crucial, since we are facing complex challenges, such as the climate crisis, which cannot be solved in isolation.

We are hoping to achieve a certain level of digitalization based on user needs, upskill our colleagues, test innovative concepts in our living lab and connect innovation activities across projects from mobility to climate change.

ONE OF OUR MAIN GOALS IS TO BUILD SERVICES AROUND THE NEEDS OF USERS, CO-CREATE TOGETHER, TEST AND THEN DEVELOP.

PETRA DŽUROVČINOVÁ



CYBERSECURITY

Cyber threats continue to proliferate and pose huge risks to both private and public organizations. In order to stay a step ahead of the sophisticated techniques used by cyber criminals, the field depends on constant innovation and new technologies such as AI and machine learning.

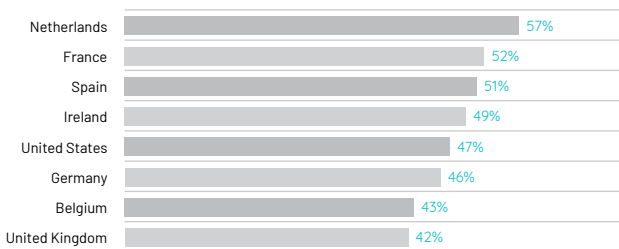
In Slovakia, the topic of cybersecurity and its development is closely connected to the story of one company. Since its humble beginnings in 1987, ESET grew into a major global player with close to

two thousand employees and revenues surpassing 500 million EUR. It is the brightest example of a digital Slovak company reaching global success. ESET headquarters are still in Bratislava and the company relies on the quality of the local workforce, a key ingredient of its success story from the very beginning. It has inspired many Slovak software firms and continues to attract local and international talent, as the company remains at the forefront of digital security innovation.



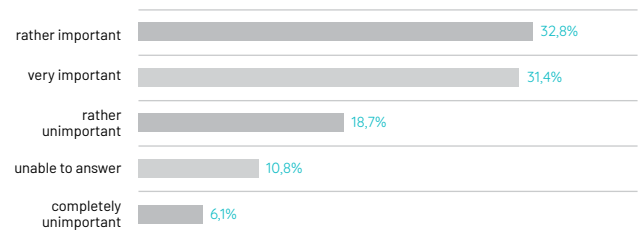
Share of companies in selected countries having experienced a cyber attack as of 2022

Source: statista.com



What role do you attribute to cybersecurity in the running of your company?

Source: statista.com



CHALLENGE

Brain drain remains to be an ongoing problem which is crippling the Slovak labor market. With 17% of Slovak students enrolled at universities abroad many of the best minds leave Slovakia and have few intentions to come back. The skills shortage in cybersecurity is even more pronounced, as organizations are upgrading their security teams to fend off sophisticated cyber threats. The post-pandemic "new normal" with unprecedented

levels of remote work presents completely new risks. Cybersecurity has been among the most in demand professions for several years globally. Requiring specific skills and certifications, the shortage of talent is showing no sign of abating. It is a shared challenge for the government as well as organizations to support building cyber skills through education and certification, and to attract experts from abroad.



LUCIA COLNÍKOVÁ
LEAGUE FOR
DIGITAL BOOST
LEAD
SAPIE

Are Slovak SMEs aware of the cyber risks associated with the process of digital transformation?

With the rise of new technologies, the increase of sharing information online, online payments or e-commerce, we see an increase in cyber attacks as well. SMEs are considered to be among the most vulnerable sectors since they often lack internal capacities, financial resources or long-term strategy on how to deal with cybersecurity as a priority for their business. Most Slovak SMEs are aware that cyber risks are interlinked with the process of digital transformation which is underlined by the feedback from SMEs themselves. Based on the survey responses, 51% of SMEs and 44% of micro companies see the threat of cybersecurity attacks on the company as the biggest challenge in the upcoming 12 months. It is also interesting that 33% of SMEs and 24% of micro companies consider cybersecurity attacks as an obstacle while implementing new technologies and going digital.

What could help them overcome this challenge and make their digital journey smoother?

SMEs would welcome support from the state, businesses, or other players in the market in several areas. According to the data, almost one third of the companies would welcome access more information about the possibilities and the added value of digitalization, while 29% lack guidance in the area of benefits and the availability of available financial tools to implement advanced digital tools.

The survey also shows that SME owners are dealing with the issue of the lack of people with the desired skillset in the market; a problem especially prevalent in the cybersecurity field. There are a number of initiatives and organizations in Slovakia which are designed to help companies grow and tackle the related challenges and the League for Digital Boost will serve as a connector which could help SMEs to digitally transform their business.



ANDREW LEE
VP OF GOVERNMENT
AFFAIRS, AND
GLOBAL CTI
STRATEGIST
AT ESET

What is the key ingredient that enabled ESET to succeed?

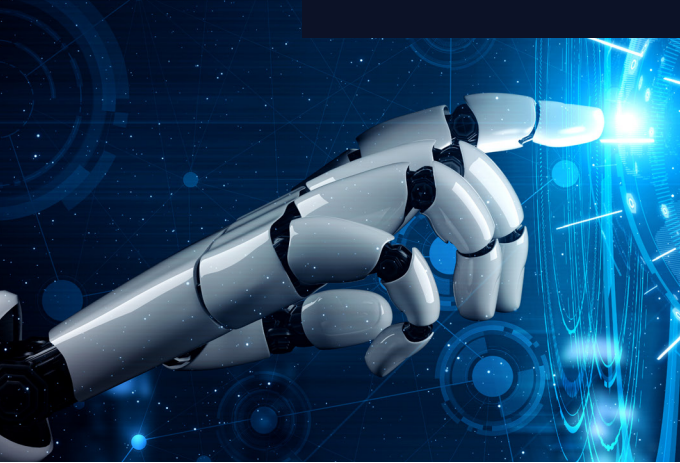
The key to ESET's success has been to focus on doing what you can with what you have. Trying to solve problems with innovation with the resources that you have available means that you have to fully dedicate to understanding the need, and addressing all of your attention towards meeting it.

ESET also learned the value of partnerships early on, rather than trying to build a large marketing or sales operation earlier on, ESET worked on finding partners who believed in the product, and then working with them to enable them to succeed.

As ESET built its portfolio of products, those partners and the loyal relationship between them and ESET became the key to unlocking the marketplace. It's hard to find a niche in the market and then be able to work on building an innovative solution in it, without having to dilute the value of the company with investments or loans, but ESET navigated this difficult path. Although at times it meant slower growth, and sometimes appearing to be behind the marketing trends, it was validated by the fact that ESET is now Europe's largest independent cybersecurity company, and almost all of the original partners are still working with the company.

THE KEY TO ESET'S SUCCESS HAS BEEN TO FOCUS ON DOING WHAT YOU CAN WITH WHAT YOU HAVE.

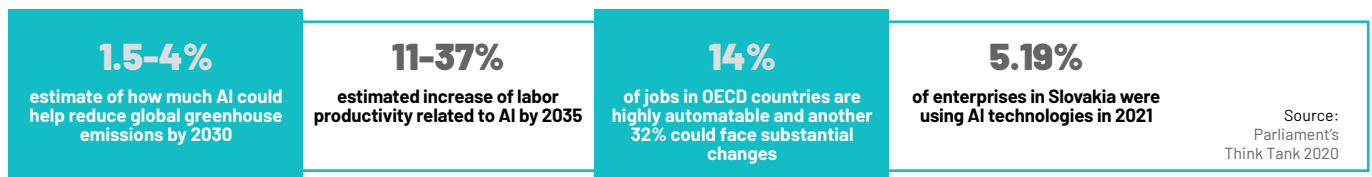
ANDREW LEE



ARTIFICIAL INTELLIGENCE

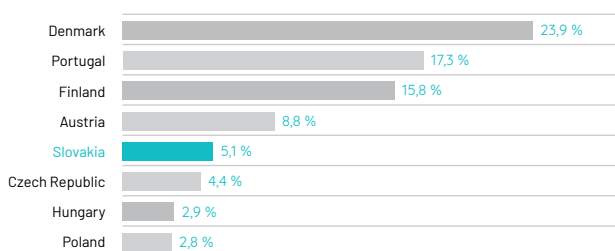
The smaller size of the Slovak economy can also be perceived as an advantage. In combination with its strategic geographic position, skilled labor force, high usage of mobile devices and widespread internet coverage, the country is an attractive testing ground for innovative business solutions. The banking sector is a good example, as several innovations of international banks were first implemented in Slovakia. Further development of the local fintech

industry is also very promising. Of course, huge potential lies in the automotive sector, where smaller innovative companies can profit from the presence of several major car manufacturers. Innovation through AI and automatization seems as the natural solution to the demands of Industry 4.0, as well as the best choice to fast-track the transformation towards a knowledge economy.



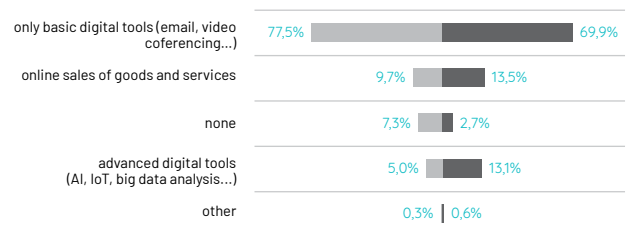
Enterprises using AI technologies in 2022

Source: digital-agenda-data.eu



Which of these digital use were you using prior to 2020 / are you using now?

Source: League for Digital Boost & Slovenská sporiteľňa SME survey (2/2023)



CHALLENGE

The implementation of AI into our daily life opens up vast possibilities how to improve its quality. The price for this comfort and new opportunities comes in the form of difficult questions regarding the boundaries between human and artificial intelligence. The associated risks are not always easy to foresee and concern the societal and ethical impact of AI. On the other hand, EU is already considerably lagging behind China and the US in terms of AI development and investment. If EU is to catch up, a favorable regulatory

environment and more support for AI research have to be a priority.

KInIT and HOPERO are two organizations which took it upon themselves to advocate wider and better use of AI to help companies innovate and succeed in the digital economy. At the same time, they advocate a responsible approach and focus strongly on discussing and understanding the ethical and moral dilemmas associated with AI.



**MÁRIA
BIELIKOVÁ**
FOUNDER AND
CEO, KEMPELEŇ
INSTITUTE OF
INTELLIGENT
TECHNOLOGIES

Which sectors of the Slovak economy have the biggest potential to implement AI-based products and services?

It depends whether we're talking about implementing AI or about creating products with AI. Implementing and using AI solutions is an open possibility for all sectors – for example the automotive sector is already using AI, although imported from abroad. Slovakia has the human capital and a well-developed IT sector with the potential to deliver global solutions in AI for various sectors. I see huge potential in this area, especially if business and industry are able to use the latest scientific knowledge quickly and effectively.

What do you perceive as the greatest challenges for the developers as well as the society when it comes to AI?

The question of data quality for AI training is a huge challenge for developers and for the entire society. It severely impacts the output quality and thus our ability to use AI to improve our lives as well as to minimize the risks of bad outcomes. Very few of those using AI realize this.

From a wider perspective, AI presents a parallel to other challenges humanity has faced in the past and continues to face today. Challenges require a change of behavior, which is difficult for us, unless we find ourselves in imminent danger. Scientists have been bringing the problem of global warming to our attention for decades, but since it concerns changing our behavior, we're in no rush to respond. It is similar with AI. AI will most certainly transform our lives and the labor market. There's a big chance that it will be a change for the better but it will still bring major shifts in the society. We need to figure out how to be sufficiently sensitive to the unequal distribution of AI's benefits. This is related to data and human capital abuse in data annotation especially in developing countries, social media manipulation with the help of AI, or the environmental impacts of big (not just language) models.



**ONDŘEJ
FERDUS**
CONFEDERATION OF
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CZECH REPUBLIC
AND AICHECK.TECH

What do you perceive as the greatest challenges for the developers as well as the society when it comes to AI?

I identify three main challenges:

1. loss of ability to learn

As automation and systems become more advanced, our opportunities grow. But if the tasks remain the same and our opportunities grow, there is a risk that people will stop trying and growing, and their ability to learn and solve problems will deteriorate. The big challenge will therefore be to redefine our work. To make it not only more enjoyable, rewarding and less time-consuming but also to keep it challenging in order to force us to keep working on ourselves.

2. resignation to adaptation

Advances in AI, e.g. in natural language processing, have gained such momentum in recent months that there is not enough time to even try out a new technology before something even better is released. We are not prepared for such a rapid change in perspective and will have to change our education system to deal with AI. We should not try to fight it (plagiarism, using chatGPT to generate essays) but instead focus on learning how to live with it. But first, someone will have to help the teachers because they can't do it on their own.

3. blind trust in technology

Self-improving AI makes mistakes. Less than the average human, in some cases less than an expert, but it can make mistakes. We must not stop questioning AI and validating its outputs. We must be able to function without it, because AI will be vulnerable to hacking attacks. And with greater prevalence, attacks will come.

**THE BIG
CHALLENGE
WILL
THEREFORE
BE TO
REDEFINE
OUR WORK.**

ONDŘEJ FERDUS

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