EMERGING EUROPE

THE FUTURE OF IT

IT LANDSCAPE
REPORT

**The ultimate guide for IT buyers,
investors and experts**

2021

TECH
EMERGING
EUROPE
ADVOCATES

THE FUTURE OF IT

IT LANDSCAPE REPORT

The ultimate guide for IT buyers, investors and experts
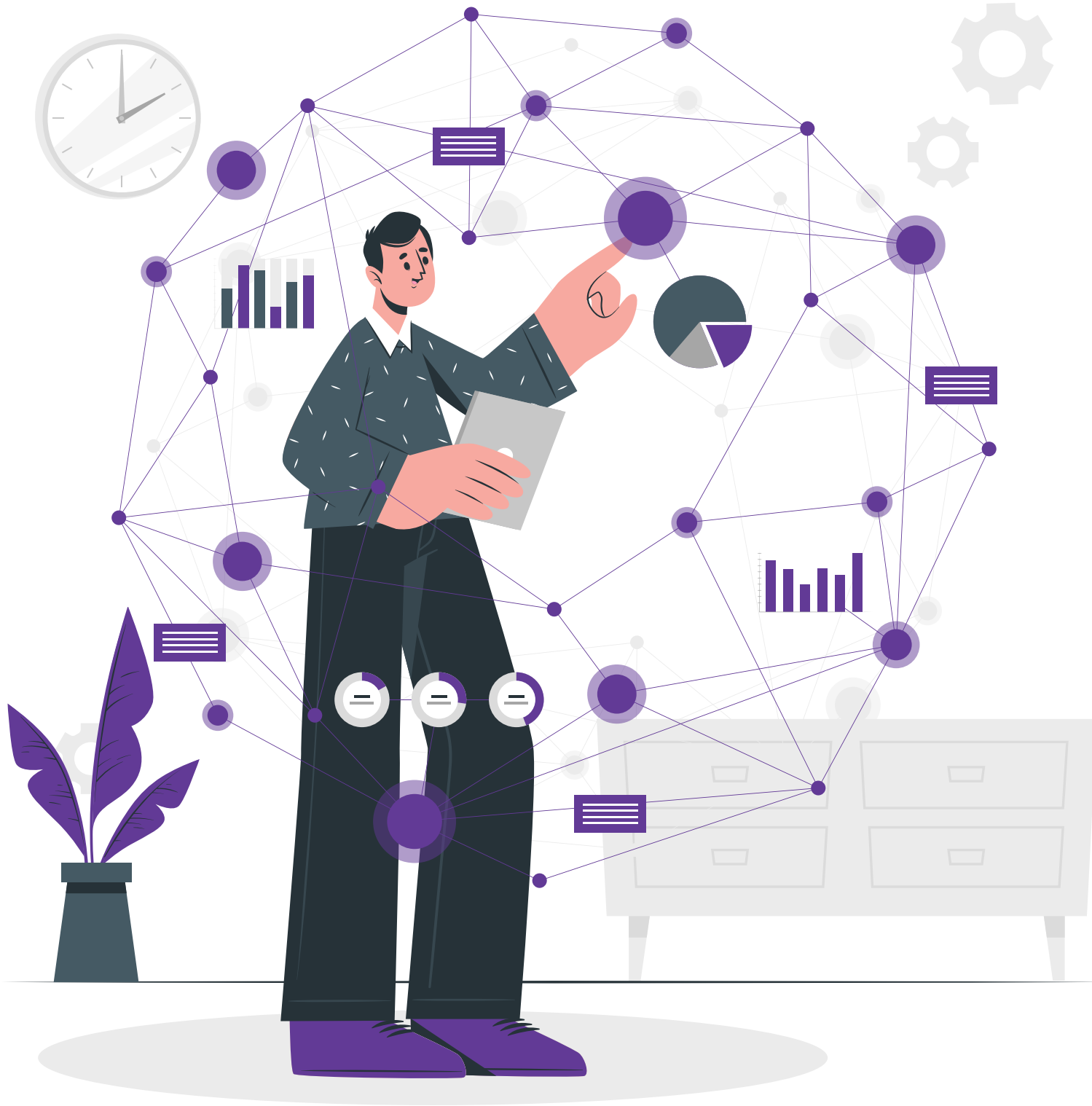
2021

TABLE
OF CONTENTS

IT Landscape Report

A WORD FROM
the Chairman of the Tech Emerging Europe Advocates Advisory Board

ROSEN PLEVNELIEV
FORMER PRESIDENT OF BULGARIA (2012-2017)

Before the Covid-19 pandemic, there was already a lot of discussion regarding the implications of technology for the future of our lives and our work.

However, the future arrived far sooner than anticipated, and many of us changed our routines dramatically. Remote virtual meetings are now commonplace and economic activity has increased on a range of digital platforms. We are all now using digital services across an ever-increasing range of domains: finance, health, commerce, to name just a few.

None of this would have been possible without the technological advancements and the unprecedented economic growth that we have observed over the last few decades, especially in the emerging Europe region.

When most emerging Europe countries were starting their transition from a centrally planned to a market economy, I was graduating from the Technical University of Sofia with a diploma in computer science, specialising in artificial intelligence. I had earlier received an award in a national computer programming competition. But it never occurred to me that my home country of Bulgaria and the entire region, for decades stuck behind the Iron Curtain, would successfully compete with free-market economies and would deliver highly advanced technology used across the globe and come up with technological solutions to fight a global pandemic.

After serving as a head of state and talking to many world leaders, both political and business, it was obvious to me that the world was moving into a new phase of development and that the world is becoming a different place. That there is a shift from a global to a regional approach - there is no way to be globally strong unless you are locally strong too.

One result of these global geopolitical changes is that large German companies are bringing at least part of their huge operations back from China, to Europe. The same goes for American companies. They are once again looking to be close to their potential customers. This offers an enormous opportunity for emerging Europe.

But for that to be successful, we need to see greater collaboration between our countries and a joint value proposition showing the region's potential. This is why it is essential to show emerging Europe's potential in technology. *The IT Landscape: The Future of IT in Emerging Europe*, co-branded by Tech Emerging Europe Advocates, is an important step towards doing just that.

A WORD FROM
Emerging Europe's Founding Partner

ANDREW WROBEL
LEAD, TEEA

When we were setting up Emerging Europe almost a decade ago, we knew we were engaging with a high-growth region. Security, amazing digital infrastructure (often much better than traditional infrastructure), innovation, and most importantly, talent have helped most of the 23 countries across emerging Europe triple (or in some cases, even quadruple) their gross domestic product since the beginning of the millennium.

This is no longer a region that robotically carries out repetitive processes at low cost. This is a region that is redesigning those processes. A region that is emerging from its shell and beginning to take the lead in creating a world in which digitalisation and AI will move us all beyond what we ever thought possible.

The region's business partners — both foreign investors and importers — begin to understand that access to talent and the quality of products and services should be the primary motive behind their decision to expand or relocate in the region.In this picture, the IT sector has a special place.

Over the last decade, I have taken part in hundreds of panel discussions, debates, fireside chats and webinars focused on the sector and I cannot recall a single one, be it in China, South Korea, South Africa, the United States or in Europe, where the growth, value proposition and potential of the sector in the emerging Europe region would not be appreciated.

But with 23 countries, some having a population of less than a million, others — around 40 million, the IT market is quite fragmented.

The IT Landscape: The Future of IT in the region is Emerging Europe's first attempt — updated annually — to look at the sector across the region and use the same methodology to understand how each and every country contributes to the size of the regional market. The IT Competitiveness Index, which analyses talent, the growth of the sector and business climate in the countries shows areas where individual countries can become even more competitive.

Finally, we have included five Central Asian countries — covered by Tech Emerging Europe Advocates, and Egypt — a massive talent pool already working with emerging Europe companies, to see how they can strengthen the IT sector in the region and also benefit from its future growth.

"A WORD FROM
the Tech Emerging Europe Advocates
ADVISORY BOARD

The Emerging Europe region is a very important part of the world for the global technology sector. The area has the talent, the innovation and the entrepreneurs to become a critical IT partner for the UK and other tech hubs right across the globe. In a time where the digital economy is driving growth and employment for countries at a rapidly increasing rate, the ambition to scale of the tech community in emerging Europe is very encouraging. I would advise tech leaders in more established hubs to truly start taking note as the ecosystem there could well represent a key location for IT and other exciting tech verticals in the years to come.

At Global Tech Advocates our mission is to connect and forge vibrant networks between tech communities internationally. Creating greater cooperation and trade in global tech is essential for supporting early-stage markets and sharing in the considerable opportunities that innovation offers for society and the economy. This report will serve a vital role in mapping many of these opportunities across the region and signposting what tech in the region has to offer today and moving forwards.

RUSS SHAW CBE
FOUNDER, TECH LONDON ADVOCATES & GLOBAL TECH ADVOCATES

Growing technology companies can be called Covid-winners since 2020. As they develop rapidly, they need external investment which in the current market environment is readily available from the investment community, via the stock exchange.

We have seen spectacular growth in sectors such as IT, video gaming and biotechnology. During the pandemic, the performance of Warsaw Stock Exchange (GPW) indices and stock sub-indices reflected this growing interest from both retail and institutional investors. For example, WIG.GAMES, which can be seen as a proxy for the 'appetite for investment' in the video gaming sector, increased by almost 54 per cent year-on-year.

I believe that the exchanges are innovative thanks to technology implementations. GPW Group's technological development initiatives are a key priority of both mine and our strategy #GPW2022. This ambition is attributed to GPW Tech, our technology subsidiary, which is responsible for the inhouse development and subsequent commercialisation of IT products and solutions for the financial sector.

MAREK DIETL
CEO, WARSAW STOCK EXCHANGE

Talent, then talent, and again talent. We are not publicising sufficiently how gifted and hard working people in our countries are. We are missing a trick. Investors only know about this wealth of talent from anecdotes they hear from companies that have already invested in the region. Central and Eastern Europeans should stick together. We have something special to offer on the global stage.

And not only that. According to Eurostat, eight out of ten ICT specialists across the European Union are men. The proportion of female ICT specialists is significantly higher in emerging Europe. In Bulgaria, over 30 per cent of ICT specialists are women, in Romania, over 26 per cent, followed by Latvia and Lithuania.

We need to find all ways possible to boast about that internationally.

OLGA GRYGIER-SIDDONS
A BUSINESS ADVISOR AND MENTOR, FORMER CEO OF PWC CEE

BRUNO BALVANERA
FORMER MANAGING DIRECTOR FOR CENTRAL ASIA AT THE EUROPEAN BANK FOR RECONSTRUCTION AND DEVELOPMENT

Covid has significantly accelerated the inevitable digitalisation of all aspects of our lives: familiar, social, political, health, trade, financial, cultural, academic.

An infinite number of new platforms have been developed and are under constant development all around the world. No country is excluded from this process and all countries have a relatively similar competitive advantage.

Winners will be the fastest, most versatile and most creative.

With the high levels of internet and telephone penetration, the opportunities have no boundaries and countries in Eastern Europe, the Caucasus and Central Asia are well placed to be key players of the world transformation on the back of its young, well-educated and thirsty population!

MARTA ARSOVSKA TOMOVSKA
DIGITAL INNOVATION EXPERT, ADVISER TO THE SERBIAN PRIME MINISTER

The biggest strength of the emerging Europe region, especially of the Balkans countries — lies in their geopolitical context. Historically, geopolitical turbulences turned people here in the best problem solvers, and the best innovators, as they live in constant "survival mode". Additionally, by bridging east and west, countries in the region need to maintain good relations with both. Finally, this part of the world is famous for good math and technical education, which produces solid engineering potential.

Why is this important? Take the example of Serbia. The crisis only helped Serbia unlock its full potential. The foundation was set by the dedicated leadership in the past few years, but in 2020, the most difficult year for the world - the country managed to have the highest GDP growth in Europe. Three reasons – agility and excellent problem-solving skills, great relations with both east and west, and finally, excellent tech skills. I have the feeling that emerging Europe is not going to waste this crisis but position itself as the fresh frontrunner.

SAMUEL BURKE
TECH CORRESPONDENT AND ANCHOR, CNN AFFILIATE NETWORKS

In my decade covering technology with CNN, I've seen many countries and regions attempt to become "the next Silicon Valley." Start-ups across emerging Europe are proving they have more than just the desire — they're already making it a reality.

The region's deep history of advanced engineering, market access as well as advanced language skills have made them key players in the tech ecosystems. Now, emerging Europe faces an enviable challenge of how it will leverage the partnerships and investments flowing into the region to bolster its flourishing tech sector.

"
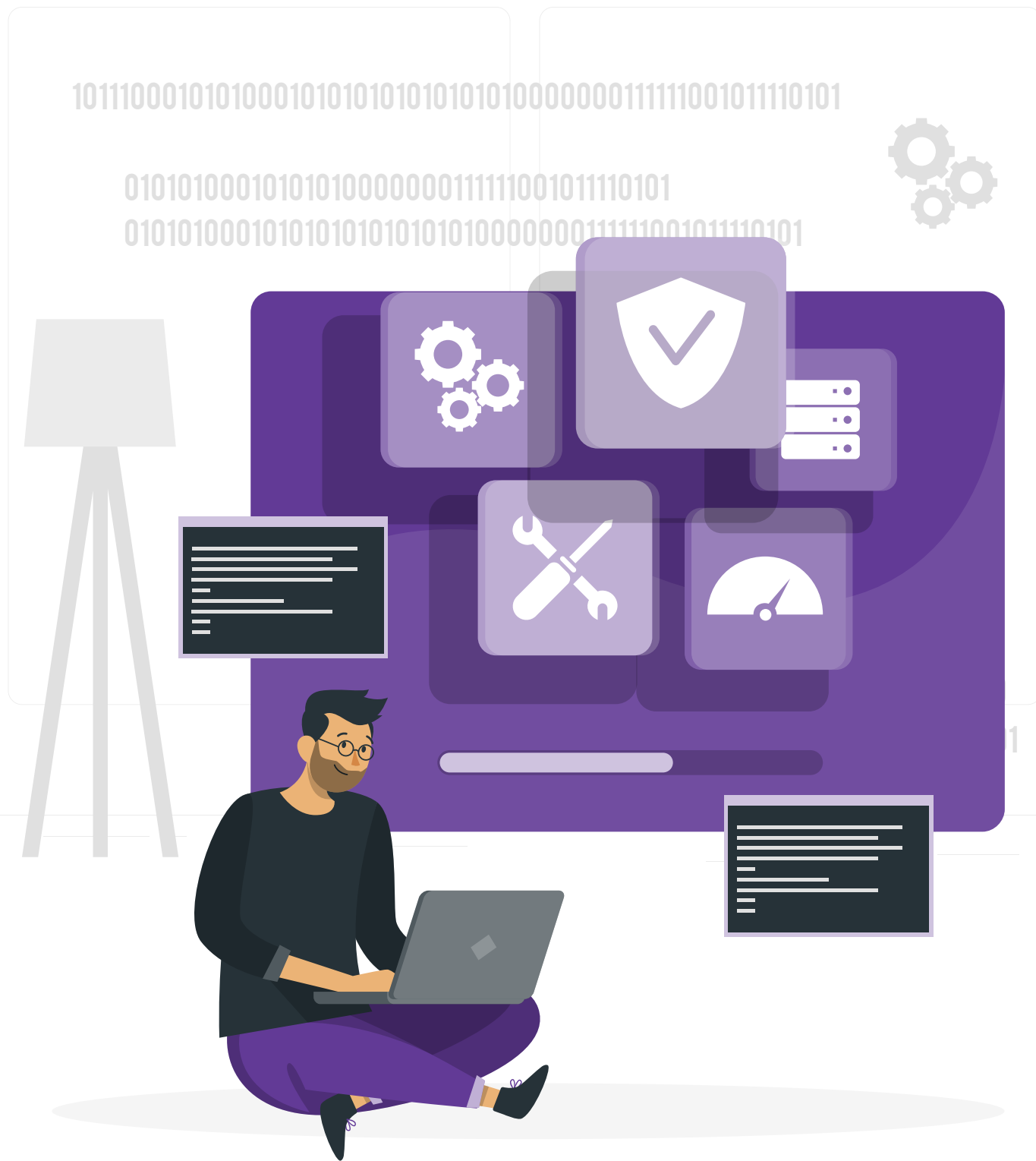
A WORD FROM
Clutch

MIKE BEARES
FOUNDER, CLUTCH

- How do buyers of business services find reliable, high-quality sellers of business services that meet their budget, location, and project needs?
- How do sellers of business services connect with potential buyers to grow their business?

We are thrilled to have partnered with Emerging Europe to expand that mission and give even more visibility to companies from emerging Europe while helping buyers looking for an outsourced provider.

Consumers don't make many purchases without looking for third party content on products on services. Over the years, we have seen that behaviour from the consumer side translate into the business-to-business space world as well.

During the buying process, decision-makers are looking for content that will help them learn as much as possible about potential partners to build trust in them and find the best match for their needs. In fact, 94 per cent of businesses have used an online review to help make a B2B purchasing decision. That's almost all businesses who have hired a developer, partnered with a web designer, or purchased custom software.

Reviews help buyers understand what types of clients a company works with, the types of projects they work on and the end client's feedback on the experience and outcomes. But, unlike content provided by the brands themselves, such as a blog post or case study, reviews provide social proof. Buyers are going to trust what someone else says about a brand more than what the company says about itself.

On the flip side, small and medium-sized businesses, particularly outsourced IT services providers, can struggle to be found and stand out from the competition. Reviews are a great way to get social validation, build trust in your brand, and differentiate yourself from your competitors as a leader in the global B2B market. Seven years ago, I founded Clutch to solve this 2-sided problem:
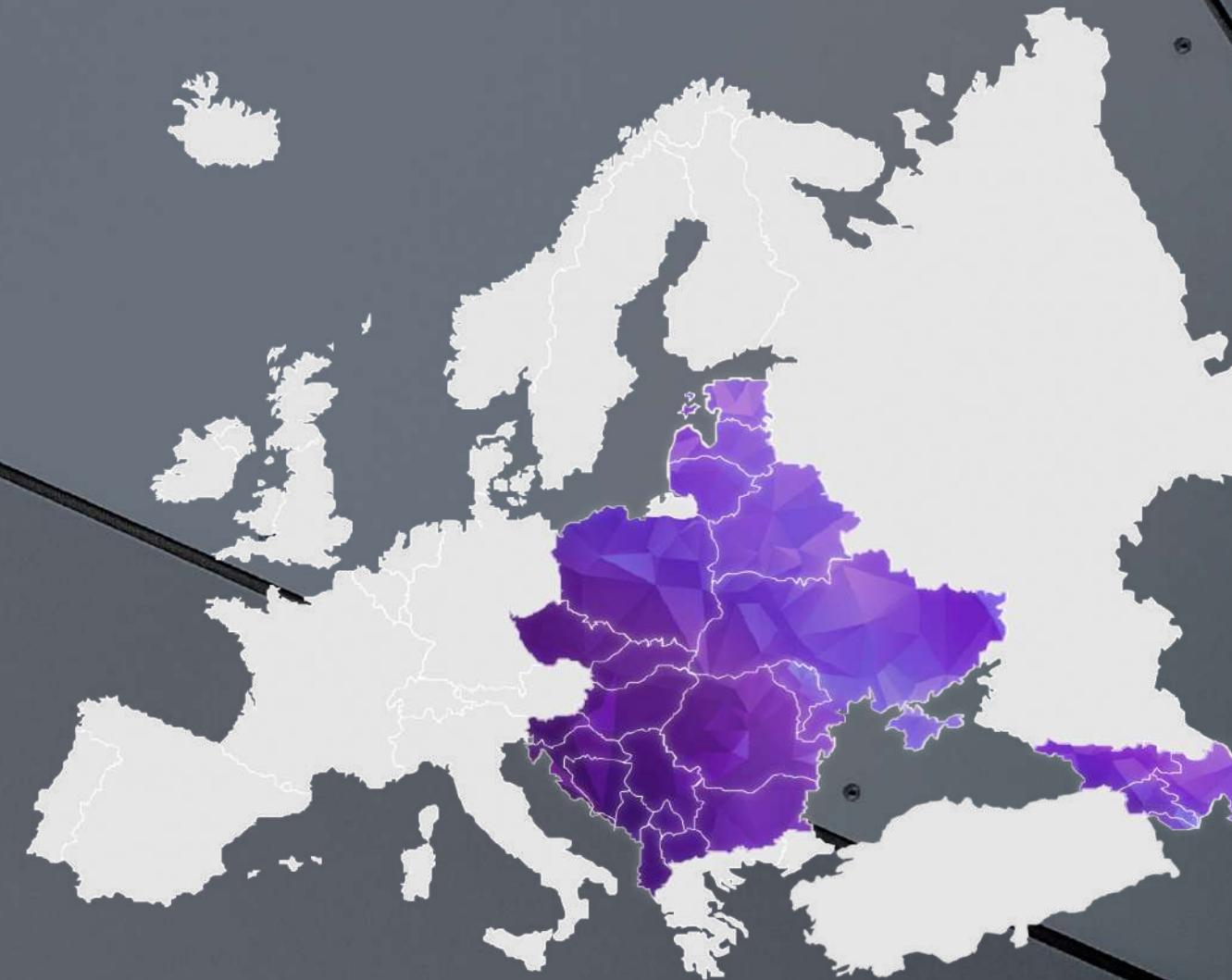
![Emerging Europe logo]

Partner with the world's leading hub of business information and connections related to emerging Europe.

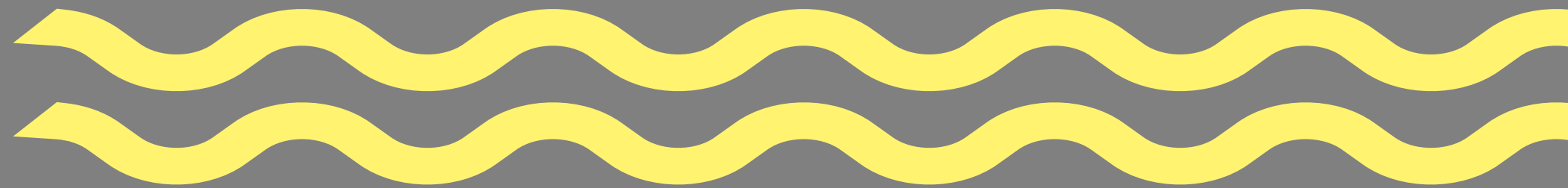**Reach your business and communication goals faster and more effectively.**

INTELLIGENCE + EXPOSURE + CONNECTION

Visit the *Work with Emerging Europe* microsite to find out more about our projects and bespoke services.
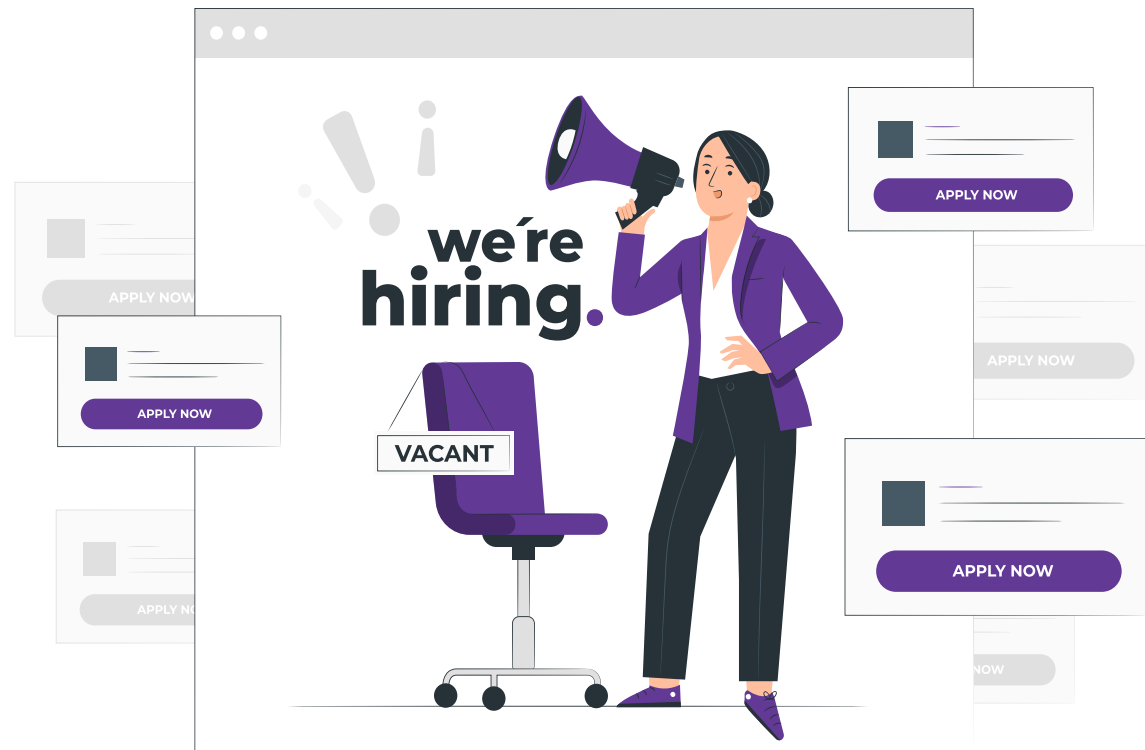
REGIONAL ANALYSIS

FOR EMERGING EUROPE'S OUTSOURCING INDUSTRY, COVID-19 IS A REAL OPPORTUNITY

The Covid-19 pandemic has been one of the most disruptive events since World War II.

Not only has it had – and will continue to have – an impact on the global economy, Covid-19 is disrupting various global trends. Agility is key, and those who respond and adapt to what has become known as the new normal will thrive in the post-pandemic world.

But how has Covid-19 impacted the outsourcing sector, which has long been a source of disruptive technology?

According to Deloitte's 2020 Global Outsourcing Survey, the uncertainty created by Covid-19 has instilled caution, as everyone in the industry adjusts.

The survey says that outsourcing decisions will play a significantly more strategic role in short-term resilience and long-term growth. However, the outsourcing industry itself is not unaffected by the pandemic, and providers are having to adapt quickly to new ways of working.

The impact has been greater on business process outsourcing (BPO) than on information technology outsourcing (ITO). This is largely due to the regulatory limitations on the extent of virtual workforces, rendering BPO firms under-prepared.

The pandemic exposed deficiencies in levels of preparedness. Business continuity has become critical and will test the ability of service providers to deliver from home offices and maintain their own supply chains, while delivering the desired level of data security and work productivity. It has also sped up cloud adoption, helping organisations to scale their technology resources according to changing demand.

The physical co-location of resources is no longer necessary to develop a trusting relationship in the workplace. Physical presence is no longer needed when signing contracts or hiring new staff. That has made it possible to access global talent from the most cost-effective locations.

At the same time, businesses worldwide are continuing to struggle to find qualified talent despite millions of candidates looking to re-enter the workforce.

Randstad Sourceright's 2021 Talent Trends Report reveals that 40 per cent of human capital leaders report talent scarcity has negatively impacted their organisation, highlighting a desperate need for reskilling. The survey of 850 C-suite and human capital leaders in 17 markets across the world found that 40 per cent of HR leaders continue to experience talent scarcity in IT.

"British companies now more than ever need fast access to flexible, innovative and skilled labour to help them achieve their quickly changing business objectives," says Kerry Hallard, the chief executive of the Global Sourcing Association and the chairwoman at the Global Technology and Business Services Council.

"Emerging Europe's countries are perfectly positioned to take advantage of the situation created by the transitional changes occurring within the industry. A relatively recent entrant onto the business services scene, these countries have garnered a reputation for producing high value services through the use of a highly skilled labour force, operating at consistently high rates of a conscientious and diligent work-ethic, with high levels of English fluency, a quality that objectively appeals to many nations in the Western world," she adds.

"Global organisations tend to operate multifaceted infrastructures internationally, most often with several locations throughout multiple countries. When one of these organisations decides to transfer activity from one site to another, everyone is affected: suppliers, distributors, service providers and consumers," Debi Hamill, CEO at the International Association of Outsourcing Professionals (IAOP).

"Trends have always shown that proximity, cost and language skills are the most significant determining factors for many businesses seeking services outside their native country. Culturally speaking, this is important for emerging Europe as it gives these countries a nearshore advantage. When it comes to emerging European countries, another advantage they have over other global markets is their friendliness and friendliness toward neighbouring countries, which allows for business ease in gaining nearshore cost advantages," Ms Hamill adds.

"Unlike other leading delivery destinations such as India and the Philippines, the emerging Europe countries have typically been awarded contracts on a smaller scale but consisting of higher value transactional work. The smaller size of these contracts means their talent pools are not under the same level of threat to automation as countries such as India, who are predicted to lose about a third of their current work to robotic process automation (RPA), which has led to a wholescale upskilling and repositioning exercise for India. This therefore places the emerging Europe countries, who also benefit from close proximity and aligned time zones and cultures, in a strong position to continue growth, providing they continue their investment in talent and infrastructure and maintain an appealing," says GSA's Ms Hallard.

"Over the last couple of years, the GSA has witnessed huge growth in its member companies investing in countries such as Poland, Czechia, Romania, Bulgaria and Ukraine – for the delivery of business services ranging from customer service through finance and accounts to software development – with Ukraine being the most recent destination to cement its reputation as a key tech hub. The investment has come in the form of establishing and growing shared service centres, as well as through partnering with domestic players. Companies such as Ciklum, NIX Solutions, EPAM, ScaleFocus, and 60K are all examples of emerging Europe-based companies that have gained stable footholds in the global sourcing eco-system, helping to diversify the UK service provider community whilst enhancing the reputation of emerging Europe-based operations – driving growth for all firms," she adds.

The 2021 Global Outsourcing 100 includes over a dozen companies headquartered or with main delivery centres in the emerging Europe region, including Sigma Software, IBA Group, Innovecs, Solbeg, Intellias.

"However, for CEE countries to take full advantage of this opportunity open to them, it is integral standards do not drop or stagnation occur. They cannot sit on their laurels and it is imperative that talent continues to be developed and nurtured, specially at middle management levels, where an on-going dearth is predicted. Furthermore, as the landscape continues to evolve at a pace, the CEE region must ensure it stays value competitive – a significant increase in costs or attrition rates will negatively impact their opportunity to capitalise on the advantage afforded to them. This could and should be a golden period for the CEE region to prosper as a leading delivery destination serving buy-side companies directly, as well as service providers, around the world," GSA's Ms Hallard adds.

The emerging Europe region may not yet be of the size and scale of India as an outsourcing delivery destination, but it has emerged as an IT powerhouse over the last two decades and is catching up quickly. With over 3.7 million individuals employed in the ICT sector, almost twice as many as in Eastern Europe, India is unarguably the largest player in the sector globally. However, when we look at the number of IT employees per 100,000 inhabitants, emerging Europe's numbers are four times higher. In countries like Estonia, it is nine times higher.

With its progressive nature and rich talent pool of highly educated resources, together with a culture embedded in innovation and matched with the desire to deliver service excellence in the new global context backed by a strong entrepreneurial spirit developed in a challenging historical context, emerging Europe is a reliable global partner.

GPW
WARSAW STOCK EXCHANGE

Common success Common challenges

GPW | BONDSPOT | TGE

GPW TECH | GPW BENCHMARK | INFO ENGINE

GPW VENTURES | IRGiT

BUSINESS LINES

LISTING

STOCK MARKET

DEBT MARKET

DERIVATIVES MARKET

COMMODITY MARKET

INFORMATION PRODUCTS

STRATEGIC INITIATIVES

STOCK MARKET
- GPW Growth
- Securities Lending System
- Trading Platform

DEBT MARKET
- BondSpot Development
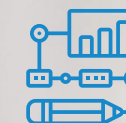
DERIVATIVES MARKET
- Derivatives Development

COMMODITY MARKET
- Waste and Secondary Raw Materials Trading Platform
- Agricultural Commodity Market

INFORMATION PRODUCTS
- GPW Data
- GPW TCA TOOL

NEW BUSINESS LINES
- GPW Private Market
- GPW Tech
- GPW Ventures

GPW
WARSAW STOCK EXCHANGE

www.gpw.pl

IT COMPETITIVENESS INDEX

The IT Landscape: The Future of IT gives a regional overview of the IT sector in the region, available talent, its costs as well as the room for potential growth. The IT Competitiveness Index outlined below evaluates the level of competitiveness of each individual country.

Despite not scoring highest across the board, Poland's IT sector remains the most competitive in the region. Hungary and Serbia perform better in the talent component while Estonia, Lithuania, Czechia, Slovenia and Latvia rank better when it comes to business climate.

In the overall ranking, Estonia, Czechia, Hungary and Romania join Poland in the top five. Despite having a large IT sector, Ukraine, whose position in the talent component is similar to Poland's, lags behind in the development of the sector and business climate component. That can also show room for further development.

Bosnia and Herzegovina, North Macedonia and Moldova are the least competitive countries for the IT sector. As far as talent is concerned, North Macedonia ranks 23rd. In terms of sector development, Azerbaijan and Kosovo take the lowest places. The business climate is least favourable in Ukraine.

Country	Rank	Points	Talent	Sector	Business climate
Poland	1	61.40	32.87	17.37	11.16
Estonia	2	58.13	29.05	14.83	14.24
Czechia	3	57.42	28.25	16.66	12.51
Hungary	4	54.42	36.40	10.35	7.67
Romania	5	51.83	29.28	14.66	7.89
Slovenia	6	49.64	28.13	9.18	12.33
Serbia	7	46.46	33.59	6.64	6.22
Latvia	8	46.09	24.13	9.95	12.00
Croatia	9	45.77	30.28	7.53	7.97
Lithuania	10	44.18	23.32	7.67	13.19
Ukraine	11	44.12	32.79	7.77	3.56
Bulgaria	12	43.67	27.24	8.75	7.68
Slovakia	13	43.16	25.10	8.70	9.36
Belarus	14	42.81	27.63	8.00	7.18
Armenia	15	40.26	28.88	3.53	7.85
Georgia	16	39.56	25.74	2.99	10.83
Albania	17	38.93	31.13	3.09	4.70
Kosovo	18	38.46	30.39	2.73	5.34
Montenegro	19	35.84	25.27	4.22	6.35
Azerbaijan	20	33.02	25.18	2.75	5.09
Bosnia and Herzegovina	21	32.99	25.46	3.86	3.67
North Macedonia	22	32.99	22.11	4.02	6.85
Moldova	23	31.13	23.21	3.91	4.01

TALENT

Country	TOTAL FOR TALENT (OUT OF 60)	Competitiveness index (TALENT) – Labour and skills								Competitiveness index (TALENT) – Education							
		Number of people working in ICT	Number of people working in ICT per 100,000 of population	Annual growth of the number of people working in ICT per 100,000 of population	Average salary in ICT	Average annual growth of average salary in ICT as percentage of average regional ICT salary	EF EPI rank	International Mathematical Olympiad Place	PISA Mathematics rank	Number of ICT students	Annual growth of the number of ICT students	Number of ICT graduates	Annual growth of the number of ICT graduates	Number of ICT students per 100,000 of population	Annual growth of the number of ICT students per 100,000 of population	Number of ICT graduates per 100,000 of population	Annual growth of the number of ICT graduates per 100,000 of population
Hungary	36.40	2.59	2.52	3.18	2.74	4.20	5.74	2.76	2.10	0.57	2.00	0.38	2.00	1.20	2.00	0.45	2.00
Serbia	33.59	2.00	2.49	3.15	5.30	3.88	5.49	2.34	1.54	0.57	0.81	0.39	0.95	1.94	0.84	0.91	0.99
Poland	32.87	7.00	1.98	2.37	2.56	4.53	5.23	3.00	2.94	1.05	0.21	0.74	0.20	0.44	0.22	0.20	0.20
Ukraine	32.79	4.91	0.99	1.87	7.65	0.70	2.24	2.83	1.71	2.00	0.78	2.00	0.66	1.36	0.81	1.58	0.70
Albania	31.13	0.89	0.86	3.62	7.49	4.82	2.28	0.34	1.43	0.33	0.73	0.33	1.71	1.84	0.75	2.00	1.71
Kosovo	30.39	0.83	1.20	4.37	7.70	7.00	3.04	0.30	0.30	0.26	0.20	0.22	1.48	1.39	0.20	0.44	1.46
Croatia	30.28	1.48	2.69	3.92	3.60	4.68	6.00	2.10	1.88	0.29	0.52	0.27	0.50	0.64	0.59	0.54	0.57
Romania	29.28	3.25	1.51	1.73	2.80	3.54	4.97	2.69	1.20	0.86	0.84	0.69	1.26	0.99	0.88	0.75	1.30
Estonia	29.05	1.10	5.00	2.65	1.14	3.82	3.75	1.09	3.00	0.25	0.66	0.23	1.28	2.00	0.65	1.17	1.25
Armenia	28.88	1.08	1.80	5.00	6.64	3.56	1.97	1.90	1.44	0.26	0.68	0.26	1.11	0.68	0.70	0.69	1.12
Czechia	28.25	3.14	3.06	2.48	1.11	4.11	4.46	2.41	2.55	0.52	0.83	0.43	0.45	0.88	0.82	0.59	0.42
Slovenia	28.13	1.12	3.08	1.39	0.80	5.25	6.00	1.77	2.81	0.25	0.82	0.23	1.19	1.00	0.79	0.49	1.14
Belarus	27.63	2.47	2.45	3.12	4.84	4.10	2.40	1.57	1.99	0.55	0.35	0.53	0.21	1.17	0.38	1.28	0.22
Bulgaria	27.24	2.10	2.70	2.39	4.14	3.20	4.20	1.85	1.37	0.39	0.94	0.32	0.68	0.80	0.98	0.42	0.74
Georgia	25.74	0.90	0.57	0.50	8.00	6.07	2.13	2.58	0.65	0.31	1.02	0.24	0.22	1.07	1.02	0.23	0.22
Bosnia and Herzegovina	25.46	0.87	0.50	3.93	5.90	5.33	3.90	1.13	0.81	0.28	0.43	0.24	0.35	0.76	0.45	0.22	0.36
Montenegro	25.27	0.70	1.35	1.91	5.78	5.51	2.53	0.49	1.16	0.20	0.81	0.20	1.09	1.03	0.81	0.62	1.08
Azerbaijan	25.18	1.56	0.84	1.44	7.95	6.81	0.60	0.79	1.04	0.35	0.48	0.39	0.95	0.20	0.43	0.48	0.87
Slovakia	25.10	1.76	2.63	2.36	1.84	4.87	4.02	1.77	2.23	0.30	0.57	0.30	0.51	0.41	0.57	0.49	0.49
Latvia	24.13	1.00	2.49	1.65	3.43	4.07	3.39	0.71	2.49	0.28	0.79	0.23	0.22	1.72	0.84	0.55	0.28
Lithuania	23.32	1.17	2.44	3.62	1.14	3.14	3.84	1.20	2.13	0.24	0.45	0.24	1.11	0.45	0.51	0.46	1.17
Moldova	23.21	1.07	2.02	2.07	6.92	1.99	2.32	1.28	1.08	0.24	0.65	0.24	0.77	0.50	0.76	0.41	0.90
North Macedonia	22.11	0.85	1.09	1.82	5.78	4.09	2.21	0.53	0.61	0.29	0.86	0.22	0.37	1.79	0.86	0.39	0.35

SECTOR AND BUSINESS CLIMATE

Country	TOTAL FOR SECTOR (OUT OF 25)	Competitiveness index (SECTOR)			
		Value added of ICT	Value added of ICT per capita	Export of ICT services	Export of ICT services per capita
Poland	17.37	7.50	3.06	5.00	1.80
Czechia	16.66	4.71	6.04	2.88	3.03
Estonia	14.83	1.33	7.50	1.00	5.00
Romania	14.66	4.86	3.64	3.76	2.40
Hungary	10.35	2.75	3.54	1.92	2.15
Latvia	9.95	1.21	4.35	0.97	3.43
Slovenia	9.18	1.29	4.58	0.84	2.47
Bulgaria	8.75	2.05	3.32	1.40	1.98
Slovakia	8.70	1.74	3.26	1.37	2.34
Belarus	8.00	1.93	2.35	1.74	1.99
Ukraine	7.77	2.79	1.15	2.75	1.08
Lithuania	7.67	1.27	3.44	0.87	2.09
Croatia	7.53	1.46	3.18	0.98	1.91
Serbia	6.64	1.46	2.04	1.31	1.84
Montenegro	4.22	0.77	1.87	0.50	1.07
North Macedonia	4.02	0.85	1.41	0.60	1.17
Moldova	3.91	0.88	1.38	0.61	1.05
Bosnia and Herzegovina	3.86	0.96	1.49	0.58	0.82
Armenia	3.53	0.84	1.09	0.61	0.99
Albania	3.09	0.83	1.04	0.53	0.69
Georgia	2.99	0.85	0.97	0.53	0.65
Azerbaijan	2.75	0.97	0.78	0.50	0.50
Kosovo	2.73	0.75	0.75	0.51	0.72

Country	TOTAL FOR BUSINESS CLIMATE (OUT OF 15)	Competitiveness index (BUSINESS CLIMATE)				
		Ease of Doing Business Rank	Index of Economic Freedom Rank	Social Progress Index Rank	Human Development Index Rank	Corruption Perception Index Rank
Estonia	14.24	2.70	3.00	2.89	2.65	3.00
Lithuania	13.19	2.89	2.81	2.47	2.40	2.62
Czechia	12.51	2.01	2.58	2.84	2.75	2.33
Slovenia	12.33	2.18	1.53	3.00	3.00	2.62
Latvia	12.00	2.67	2.29	2.31	2.25	2.48
Poland	11.16	2.10	1.77	2.52	2.35	2.41
Georgia	10.83	3.00	2.94	1.16	1.31	2.41
Slovakia	9.36	1.65	1.20	2.26	2.15	2.10
Croatia	7.97	1.18	0.91	2.10	1.99	1.80
Romania	7.89	1.09	2.10	1.74	1.76	1.20
Armenia	7.85	1.47	2.23	1.44	0.61	2.10
Bulgaria	7.68	0.95	2.16	1.86	1.50	1.20
Hungary	7.67	1.16	1.18	2.04	2.10	1.20
Belarus	7.18	1.29	0.86	1.62	1.61	1.80
North Macedonia	6.85	2.73	1.98	1.00	0.58	0.57
Montenegro	6.35	1.20	0.82	1.13	1.80	1.40
Serbia	6.22	1.74	1.14	1.32	1.20	0.83
Kosovo	5.34	1.04	1.49	1.07	1.07	0.68
Azerbaijan	5.09	2.26	1.85	0.30	0.37	0.30
Albania	4.70	0.48	1.32	1.20	1.03	0.68
Moldova	4.01	1.38	0.87	0.95	0.30	0.51
Bosnia and Herzegovina	3.67	0.30	0.93	0.98	0.89	0.57
Ukraine	3.56	0.89	0.30	1.04	0.85	0.48

EGYPT

Egypt is not officially included in the IT Competitiveness Index as it is not an emerging Europe country. For the purpose of the report it has, however, been benchmarked against the 23 countries.
The country gathered 40.68 points out of 100. As far as individual components are concerned, if included in the region, it would rank second as far as talent is concerned. The business climate and the development of the IT sector show room for development.

Country	TOTAL FOR TALENT (OUT OF 60)	Competitiveness index (TALENT) – Labour and skills								Competitiveness index (TALENT) – Education							
		Number of people working in ICT	Number of people working in ICT per 100,000 of population	Annual growth of the number of people working in ICT per 100,000 of population	Average salary in ICT	Average annual growth of average salary in ICT as percentage of average regional ICT salary	EF EPI rank	International Mathematical Olympiad Place	PISA Mathematics rank	Number of ICT students	Annual growth of the number of ICT students	Number of ICT graduates	Annual growth of the number of ICT graduates	Number of ICT students per 100,000 of population	Annual growth of ICT students per 100,000 of population	Number of ICT graduates per 100,000 of population	Annual growth of the number of ICT graduates per 100,000 of population
Egypt	33.62	3.75	0.50	1.94	8.00	4.06	0.72	0.30	1.66	2.00	0.79	2.00	2.00	1.90	0.63	1.51	1.87

Country	TOTAL FOR SECTOR (OUT OF 25)	Competitiveness index (SECTOR)				TOTAL FOR BUSINESS CLIMATE (OUT OF 15)	Competitiveness index (BUSINESS CLIMATE)				
		Value added of ICT	Value added of ICT per capita	Export of ICT services	Export of ICT services per capita		Ease of Doing Business Rank	Index of Economic Freedom Rank	Social Progress Index Rank	Human Development Index Rank	Corruption Perception Index Rank
Egypt	5.38	3.19	0.78	0.90	0.51	1.68	0.30	0.30	0.30	0.30	0.48

CHAMPION
CONNECT
COOPERATE

Become part of a worldwide community of 20,000 tech entrepreneurs, leaders, experts and investors — and have a role in making emerging Europe a global tech hub.

TECH
EMERGING
EUROPE
ADVOCATES

Apply to become an advocate
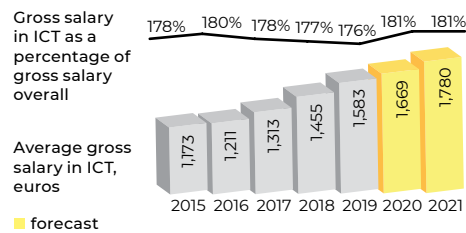
emerging-europe.com/techadvocates

REGIONAL OVERVIEW

In 2020, there were over two million people employed in the ICT sector across the 23 countries of emerging Europe. We estimate that number to grow by another three per cent in 2021.

The emerging Europe average salary in the ICT sector is forecast at 1,669 euros in 2020 and is expected to grow by close to seven per cent in 2021.
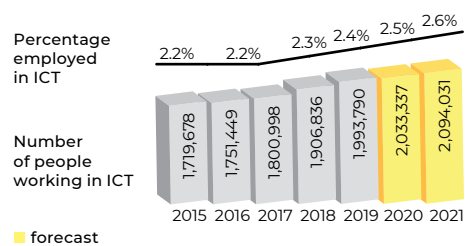
The share of the sector's value added compared to the region's GDP keeps on growing and accounted for 4.42 per cent in 2019, up by 0.17 percentage points compared to 2018.
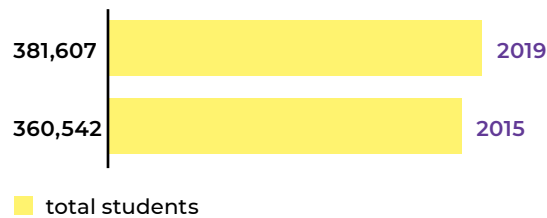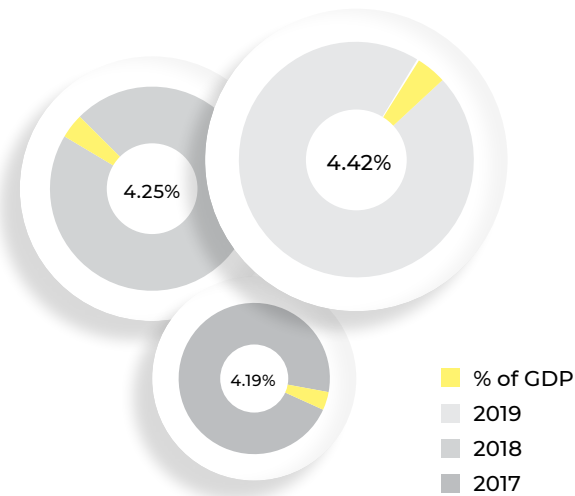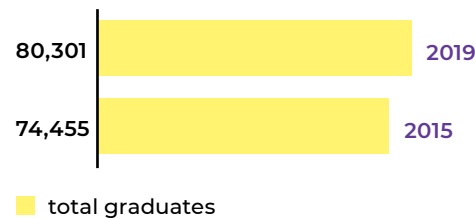
ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

178% 180% 178% 177% 176% 181% 181%

Average gross salary in ICT, euros

1,173 | 1,211 | 1,313 | 1,455 | 1,583 | 1,669 | 1,780

2015 2016 2017 2018 2019 2020 2021

☐ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.2% 2.2%   2.3% 2.4% 2.5% 2.6%

Number of people working in ICT

1,719,678 | 1,751,449 | 1,800,998 | 1,906,836 | 1,993,790 | 2,033,337 | 2,094,031

2015 2016 2017 2018 2019 2020 2021

☐ forecast

ICT VALUE ADDED

4.25%

4.42%

4.19%

☐ % of GDP
☐ 2019
☐ 2018
☐ 2017

ICT STUDENTS

381,607   2019

360,542   2015

☐ total students

ICT GRADUATES

80,301   2019

74,455   2015

☐ total graduates

The average salary in the ICT sector across the region amounted to 1,583 euros in 2019. The table below shows the average salary per country as a percentage of the emerging Europe average.

Country	Average salary in ICT (euros)	Average salary in ICT as percentage of the average regional ICT salary
Slovenia	2,432	154%
Czechia	2,350	148%
Estonia	2,342	148%
Lithuania	2,340	148%
Slovakia	2,156	136%
Poland	1,964	124%
Hungary	1,916	121%
Romania	1,899	120%
Latvia	1,731	109%
Croatia	1,687	107%
Bulgaria	1,542	97%
Belarus	1,357	86%
Serbia	1,232	78%
Montenegro	1,105	70%
North Macedonia	1,105	70%
Bosnia and Herzegovina	1,072	68%
Armenia	876	55%
Moldova	802	51%
Albania	651	41%
Ukraine	606	38%
Kosovo	593	37%
Azerbaijan	528	33%
Georgia	514	32%
Emerging Europe	1,583	100%

We have also looked at the salaries in individual countries in relation to the country's GDP per capita.

Country	GDP per capita	Average salary in ICT (euros)	Average salary in ICT as percentage of GDP per capita
Belarus	6,112	1,357	22%
Armenia	4,125	876	21%
Bosnia and Herzegovina	5,160	1,072	21%
North Macedonia	5,399	1,105	20%
Moldova	4,050	802	20%
Serbia	6,637	1,232	19%
Ukraine	3,290	606	18%
Bulgaria	8,809	1,542	17%
Romania	11,561	1,899	16%
Kosovo	3,986	593	15%
Poland	13,868	1,964	14%
Montenegro	7,961	1,105	14%
Albania	4,794	651	14%
Lithuania	17,465	2,340	13%
Hungary	14,944	1,916	13%
Croatia	13,373	1,687	13%
Slovakia	17,198	2,156	13%
Azerbaijan	4,264	528	12%
Georgia	4,201	514	12%
Czechia	20,941	2,350	11%
Estonia	21,153	2,342	11%
Latvia	15,969	1,731	11%
Slovenia	23,090	2,432	11%
Emerging Europe	9,778	1,583	16%

Estonia is the region's leader as far as the number of people employed in the ICT sector per 100,000 inhabitants is concerned: 2,430. We have also looked at the number of students and graduates per 100,000 people to show how much some of the countries in the region need to step up their game.
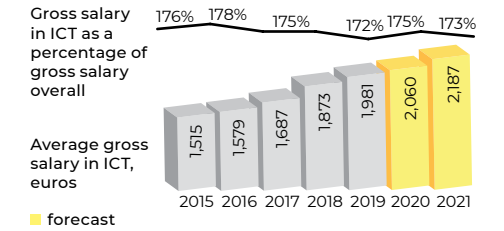
Country	Number of ICT specialists per 100,000 of population
Estonia	2,430
Slovenia	1,598
Czechia	1,589
Bulgaria	1,437
Croatia	1,432
Slovakia	1,403
Hungary	1,356
Serbia	1,345
Latvia	1,342
Belarus	1,328
Lithuania	1,324
Moldova	1,139
Poland	1,122
Armenia	1,044
Romania	920
Montenegro	852
Kosovo	786
North Macedonia	739
Ukraine	693
Albania	638
Azerbaijan	628
Georgia	515
Bosnia and Herzegovina	483
Emerging Europe	1,044

Country	Number of ICT students per 100,000 of population
Estonia	333
Serbia	325
Albania	312
North Macedonia	306
Latvia	297
Kosovo	254
Ukraine	251
Hungary	229
Belarus	226
Georgia	213
Montenegro	207
Slovenia	203
Romania	203
Czechia	187
Bulgaria	178
Bosnia and Herzegovina	173
Armenia	162
Croatia	157
Moldova	138
Lithuania	131
Poland	131
Slovakia	126
Azerbaijan	99
Emerging Europe	200

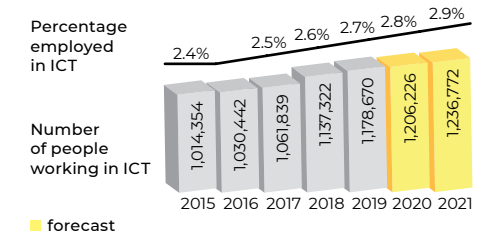| Country	Number of ICT graduates per 100,000 of population
Albania	81
Ukraine	68
Belarus	58
Estonia	54
Serbia	46
Romania	41
Armenia	39
Montenegro	37
Czechia	35
Latvia	34
Croatia	34
Slovenia	32
Slovakia	32
Azerbaijan	32
Kosovo	31
Hungary	31
Lithuania	31
Bulgaria	30
North Macedonia	29
Moldova	29
Georgia	24
Bosnia and Herzegovina	24
Poland	23
Emerging Europe	42

Command of English as well as the countries' performance in key rankings such as PISA Mathematics and the International Mathematical Olympiad are important to understand a country's potential.

Country	EF English Proficiency Index Rank	International Mathematical Olympiad Place	PISA Mathematics Rank
Albania	43	77	48
Armenia	51	37	-
Azerbaijan	86	65	56
Belarus	40	45	38
Bosnia and Herzegovina	-	56	62
Bulgaria	20	38	49
Croatia	13	32	40
Czechia	19	23	22
Estonia	25	57	8
Georgia	47	18	66
Hungary	14	13	36
Kosovo	-	78	75
Latvia	29	67	24
Lithuania	24	54	35
Moldova	-	52	55
Montenegro	-	73	53
North Macedonia	-	72	67
Poland	16	6	10
Romania	17	15	52
Serbia	15	25	46
Slovakia	22	40	32
Slovenia	-	40	14
Ukraine	44	11	43

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

176% 178% 175% 172% 175% 173%

Average gross salary in ICT, euros

1,515 1,579 1,687 1,873 1,981 2,060 2,187

2015 2016 2017 2018 2019 2020 2021

🟨 forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.4% 2.5% 2.6% 2.7% 2.8% 2.9%

Number of people working in ICT

1,014,354 1,030,442 1,061,839 1,137,322 1,178,670 1,206,226 1,236,772

2015 2016 2017 2018 2019 2020 2021

🟨 forecast

ICT VALUE ADDED

4.36% 4.44% 4.31%

🟨 % of GDP
⬜ 2019
⬜ 2018
⬜ 2017

ICT STUDENTS

163,380 2019

157,553 2015

🟨 total students

ICT GRADUATES

30,140 2019

28,054 2015

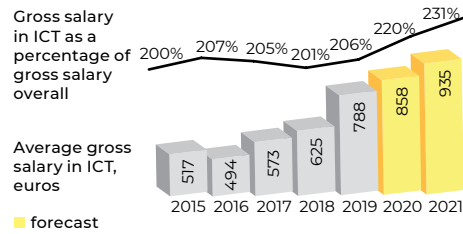🟨 total graduates

Finally, Emerging Europe has looked at its four subregions: Central Europe, Eastern Europe, North East Europe and South East Europe.

The subregion of **Central Europe** includes eight countries that joined the European Union in 2004, 2007 and 2013: Bulgaria, Czechia, Croatia, Hungary, Poland, Romania, Slovakia and Slovenia.
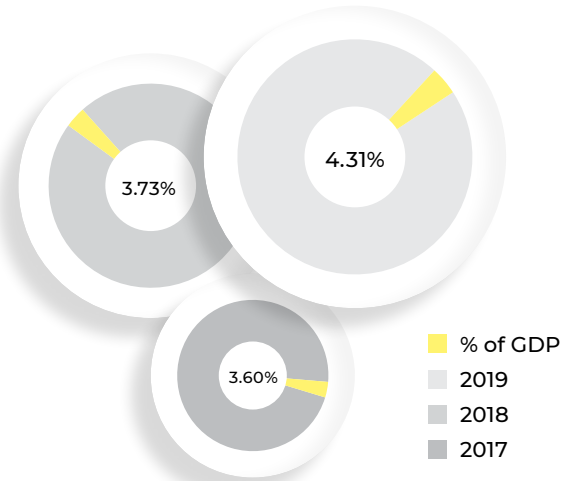
Emerging Europe's subregion of **Eastern Europe** includes six countries, also known as the Eastern Partnership countries: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine.
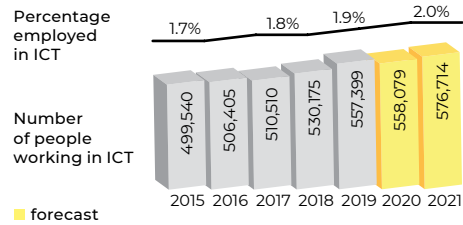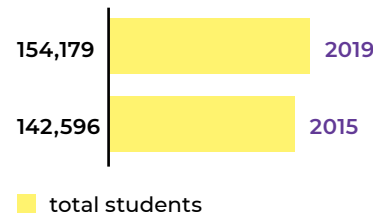
ICT GROSS SALARY IN 2015-21

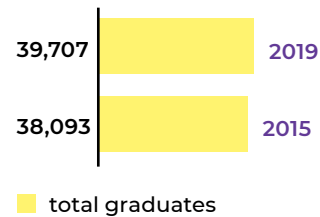Gross salary in ICT as a percentage of gross salary overall

200% 207% 205% 201% 206% 220% 231%

Average gross salary in ICT, euros

517 494 573 625 788 858 935

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT VALUE ADDED

3.73% 4.31% 3.60%

■ % of GDP
□ 2019
□ 2018
■ 2017

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

1.7% 1.8% 1.9% 2.0%

Number of people working in ICT

499,540 506,405 510,510 530,175 557,399 558,079 576,714

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT STUDENTS

154,179 — 2019
142,596 — 2015

■ total students
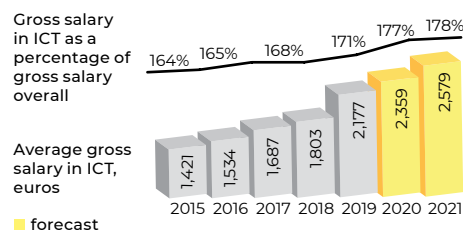
ICT GRADUATES

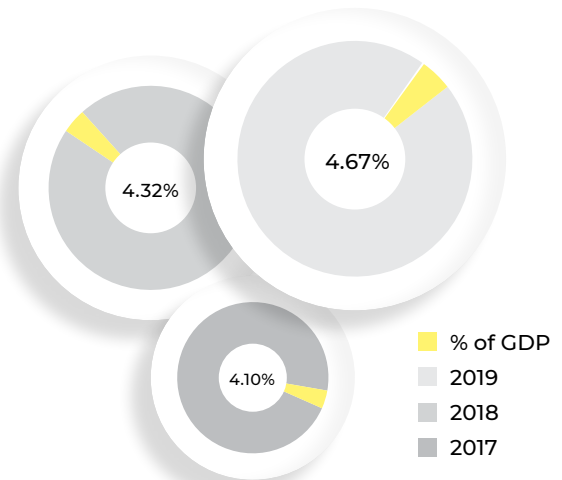39,707 — 2019
38,093 — 2015

■ total graduates

Emerging Europe's subregion of **North East Europe**, often referred to as the Baltic States, consists of three countries: Estonia, Latvia and Lithuania — three former Soviet republics that joined the European Union in 2004.
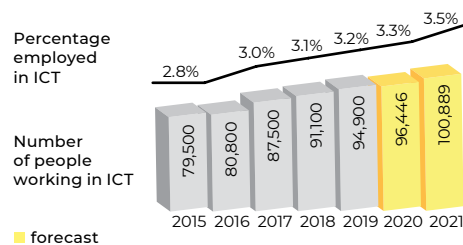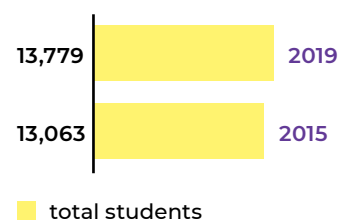
ICT GROSS SALARY IN 2015-21

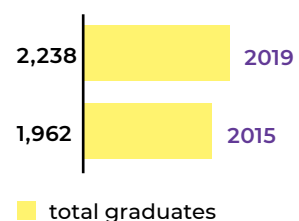Gross salary in ICT as a percentage of gross salary overall

164% 165% 168% 171% 177% 178%

Average gross salary in ICT, euros

1,421 1,534 1,687 1,803 2,177 2,359 2,579

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT VALUE ADDED

4.32% 4.67% 4.10%

■ % of GDP
□ 2019
□ 2018
■ 2017

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.8% 3.0% 3.1% 3.2% 3.3% 3.5%

Number of people working in ICT

79,500 80,800 87,500 91,100 94,900 96,446 100,889

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT STUDENTS

13,779 — 2019
13,063 — 2015

■ total students
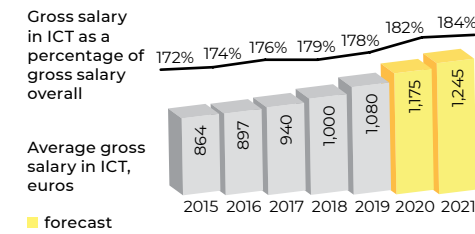
ICT GRADUATES
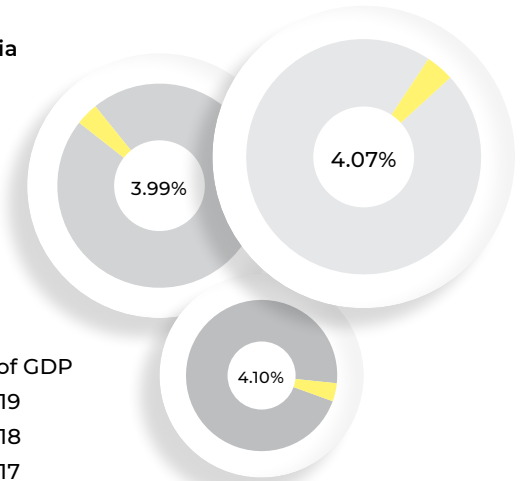
2,238 — 2019
1,962 — 2015

■ total graduates

Emerging Europe's subregion of **South East Europe**, also referred to as the Western Balkans region, consists of six countries of former Yugoslavia (minus Slovenia and Croatia, which joined the European Union in 2004 and 2013 respectively): Albania, Bosnia and Herzegovina, Kosovo, North Macedonia, Montenegro and Serbia.
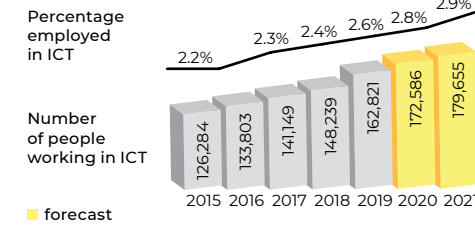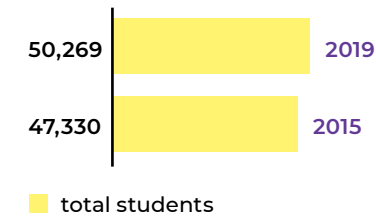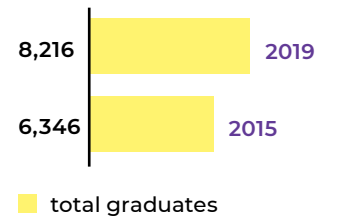
ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

172% 174% 176% 179% 178% 182% 184%

Average gross salary in ICT, euros

864 897 940 1,000 1,080 1,175 1,245

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT VALUE ADDED

3.99% 4.07% 4.10%

■ % of GDP
□ 2019
□ 2018
■ 2017

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.2% 2.3% 2.4% 2.6% 2.8% 2.9%

Number of people working in ICT

126,284 133,803 141,149 148,239 162,821 172,586 179,655

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT STUDENTS

50,269 — 2019
47,330 — 2015

■ total students

ICT GRADUATES

8,216 — 2019
6,346 — 2015

■ total graduates

KOSOVO'S HIDDEN TREASURE

ROBERT WRIGHT
CEO, RAIFFEISEN BANK KOSOVO

In the years immediately after independence in 2008, Kosovo would boast about its young population and propose it as a competitive advantage and a reason for foreign investors to come to the country.

I have to admit to having some skepticism about this at the time in the sense that being young also meant limited experience, possible immaturity and maybe a restlessness and ambition for a life outside of the country.

After working in Kosovo for more than 12 years my doubts and concerns are totally unfounded and the abilities, intellect, creativity and output of the country's young population have exceeded my expectations.

The young population of Kosovo (the average age is 29 and 53 per cent of the population is under the age of 25) is a relatively low-cost resource compared to Central or Western European countries, well educated, multilingual, readily available, and very ambitious.

The Competence Centre we have created in the bank could be mirrored on a much larger scale in the country and examples of this are now well established and continue to increase, for example Gjirafa (Kosovo's equivalent of Amazon) and ICK (the Innovation Centre of Kosovo) Which was founded to support entrepreneurship and innovation.

After 18 years in Kosovo, Raiffeisen Bank Kosovo is now a great example of a foreign investor that saw the potential, the opportunity and the long-term sustainable rewards of investing in the country's young population and we are now enjoying all the significant benefits of that belief and optimism we had about the country's future.
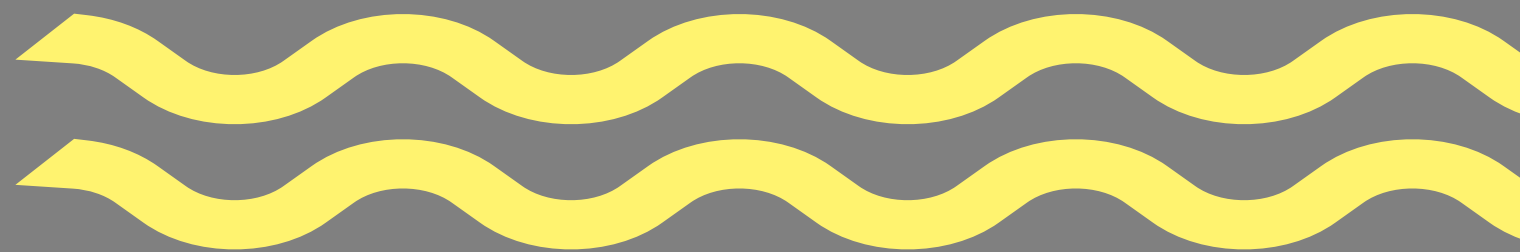
![Raiffeisen BANK Kosovo logo and photograph of the Raiffeisen Bank building]

Your partner in banking

We are the No.1 bank in Kosovo, with a strong focus in corporate banking

Contact center: +383 38 222 222 221, raiffeisen-kosovo.com

TECHNOLOGIES AND VERTICALS

THE ROLE OF **FINTECH** IN EMERGING EUROPE'S FUTURE
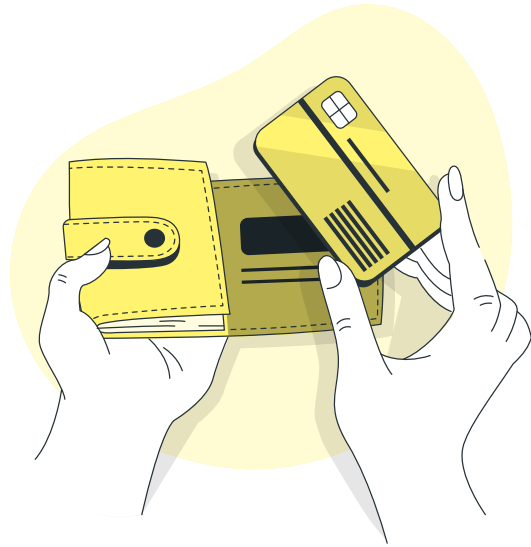
Fintech is one of the fastest growing areas of Eastern Europe's technology sector. Defined as a product or company or technology that employs innovative, newly-developed technologies in banking and financial services, fintech has seen a sharp increase in prominence over the past decade, with two trends spurring this growth: the proliferation of the internet, and the smartphone revolution.

While fintech ran into some hurdles in the more developed West, where venerable institutions and infrastructure were sometimes slow to incorporate the rapidly progressing changes, the process was smoother in Eastern Europe. With most countries in the region having spent a sizable period of the twentieth century under communism, banking and financial sectors were less complex. With the widespread economic liberalisation of the 1990s, countries in Eastern Europe managed to 'skip' decades of accumulated progress and institutionalisation to embrace new technologies. However, the penetration of digital payments remains low in much of the region: 60 per cent of adults in non-EU countries have made us of these technologies, as compared to the 90 per cent EU average.

Fintech has potential for the economic and social development

of the countries covered in this region. It can help reduce the rural-urban economic divides which plague much of Eastern Europe by reducing the necessity of physical bank locations. For the same reason, it can also simplify the process of obtaining pensions and other social payments, greatly easing the burden carried by some of the most vulnerable members of society.

This is particularly pertinent in some of the countries we cover, where over 50 per cent of people receive pensions and other social payments in cash, often having to travel long distances. Fintech also has the potential to boost the emerging economies of Eastern Europe and Central Asia by reducing the costs of remittances. Remittances contribute to double digit percentages to the GDPs of seven countries we are covering, including Armenia, Ukraine and Kosovo. The World Bank estimates

that fintech developments can save remittance senders up to 1.6 billion US dollars annually.

The Baltics are undoubtedly the most advanced and sophisticated fintech hubs. In 2020, an estimated average of 72 per cent of the population in the three Baltic states used the internet to pay bills and utilities. Tech hotspot Estonia leads in this, with 80 per cent, higher than any other country covered in this report. Estonia also has the distinction of being the home of revolutionary fintech company and unicorn Transferwise, which greatly hastened and cheapened the process of international money transfers.

Lithuania has also taken major strides to becoming a fintech hub. The country's Financial Conduct Authority created a regulatory sandbox allowing companies to test their products in a controlled environment, one of only a few such

institutions in Europe. In Latvia, one in five start-ups is involved with fintech, with the market estimated to represent over 800 million euros.

The Visegard Four - Poland, Hungary, Czechia and Slovakia - see the highest proportion of the population which uses services like online banking and money transactions. Meanwhile in the Balkans, Sofia has cemented itself as an unlikely hub for fintech businesses. Bulgarian fintech company Cash Credit is one of the biggest success stories and has managed to expand to as far as South Africa and the Philippines, and raised nearly 19 million euros in funding in 2018.

Croatia too has also established itself on the fintech map. The success of companies such as Twisto and Microblink have set the stage for continued innovation in the field. However, the Balkans lag behind the rest of Europe in terms of proportion of population which uses digital payment services. In 2017, under 10 per cent of the adult population used the internet to access their bank accounts, far below the Central European average of just under 40 per cent.

Central Asia is also unlikely success story in fintech - despite being a latecomer to the entire ICT

industry. Tajik programmers have managed to revolutionise their banking and e-commerce systems with their start-up Alif Sarmoya, the first of its kind in the region. Kazakhstan is also one few countries to run a specialised fintech regulatory sandbox, following Lithuania's example.

The region covered in this report is broad and heterogeneous, and thus it is difficult to make sweeping claims that are accurate to every country surveilled. However, in many of these countries, a lack of financing, combined with stringent financial and loaning regulations makes the development of fintech challenging.

Furthermore, many of these nations have much lower smartphone penetration than the European average, making it more difficult to provide such services to a large part of the population. Internet remains slow and expensive in some countries, while in others, a significant proportion of the population does not have access at all, either due to geographical or economic constraints.

However, the positive applications of fintech are clear and are already starting to show benefits. With several governments also realising this, the future looks promising for the continued evolution and revolution of financial services.

DIGITALISING OPERATIONS IN THE BANKING SECTOR

EVLOGI GEORGIEV
COO & PRACTICE PRINCIPAL,
FINTECH & BANKING, SCIANT

While there has been significant investment towards B2C changes in digital payments, the Covid-19 environment will compel banks to adopt more innovative B2B processes, re-designing and rebuilding back-office processes which are time-consuming, complicated, and expensive.

With more digitised operations in the banking sector, banks will offer their clients more flexibility and an easier way to manage their finances. Because cloud technology and software as a service (SaaS) offer resilience, scalability, and security, it will be a primary focus for many financial services providers in 2021.

REDUCING COST THROUGH AI/ML

Expanding the application of machine learning (ML) and artificial intelligence (AI) will help save money on human capital while reducing fraud and processing errors and generally lower long-term operating costs but will be design and capital intensive to deploy. It has been estimated that AI will reduce bank operating costs by up to 22 per cent by around 2030. This equates to savings of up to one trillion US dollars over the next decade.

McKinsey estimates that machines will perform 10-25 per cent of all banking tasks within the next few years, which directly translates to cost savings and reduction in human errors for financial institutions. Although start-up costs for robotic process automation (RPA) are hefty, most companies see a 40-100 per cent ROI within three-eight months.

CONSOLIDATION AND PARTNERSHIP BETWEEN FINTECH START-UPS AND TRADITIONAL FINANCIAL PLAYERS

Fintech start-ups have traditionally been a global disruptor, providing innovative, cutting edge technical approaches and products. With fintech firms now more established and technology more sophisticated, financial institutions will seek to license their technologies and leverage them to benefit and expand their customer base.

Traditional institutions will continue to invest in and acquire fintech technologies, and up to 82 per cent of decision-makers aim to increase fintech partnerships within the next five years.

INCREASED FOCUS ON COST SAVINGS

With massive layoffs hitting the global finance industry, financial institutions need to extract every efficiency out of their existing technology systems and labour force to handle increasing digital customer volumes while also being under income pressure from low yields and loan demand. This focus on cost savings will drive a new wave of B2B innovations.

KYC USING BEHAVIOURAL SCIENCE TECH

With banking and fintech having broad Know Your Customer (KYC) requirements, they will need to build relationships with clients that they cannot meet in-person to judge their trustworthiness, customer satisfaction, and a host of other parameters.

Data harvesting, machine learning, and AI will feed the behavioural science models that will, in turn, turn these insights into client objectives and behaviours. Integrations will improve, breaking data from silos to become more democratized. The extremely data intensive nature of the fintech industry will enable behavioral AI to grow to a whole new level.

---

sciant
UNLOCKING POTENTIAL

INDUSTRIES

FINTECH & BANKING

TRAVEL & HOSPITALITY

TRANSPORTATION & LOGISTICS

Sciant turns business visions into reality by integrating its technical expertise, sector knowledge, and business network with individual client requirements – providing reliable solutions using industry-recognized delivery methodologies.

SERVICES

► Technology Consulting ► Software Development

► Managed Services ► Specialist Talent

► Systems Integration

"They are industry experts that had a collaborative approach. Throughout our discussions, they shared their input and perspectives which we found invaluable. They were fantastic!"

Director of Business Development & Sales | **Avalara**

Clutch
FIRMS THAT DELIVER
★★★★☆

ORACLE
Cloud Marketplace
★★★★★

sales@sciant.com   www.sciant.com

THE GROWTH AND POTENTIAL OF E-COMMERCE

E-commerce is a rapidly growing industry. Defined as the activity of conducting business transactions online - most commonly manifested as shopping online - it has particular room to grow in Eastern Europe. A large part of this is because many of these countries are still in the process of digitising: even in EU countries in the region like Bulgaria and Romania, over a quarter of the population does not access the internet. This proportion is even higher in some of the Caucasus and Central Asia. Ukraine, meanwhile, has the lowest Internet penetration rate in Europe, at 58 per cent as of 2019.

This means that e-commerce has more growth potential in this region than in Western Europe, where internet access and smartphone ownership is near-universal. As the countries in the region develop their infrastructure, grow their economies and continue the linear progression of internet access, the potential market for e-commerce grows proportionally.

Furthermore, as the European Union continues expanding and taking in new members, allies and partner states in the covered region, countries benefit from access to consumers and supply chains from the more developed West. This trend has already been seen: in Romania, for example, the e-commerce market went from a valuation of 1.1 billion euros in 2014 to 2.8 billion euros in 2017. In 2020, Romania and Bulgaria saw the highest growth rates in the e-commerce sector in all of Europe, with 30 per cent increases in revenue. The increasing ubiquitousness of international e-commerce behemoths like Amazon, ebay and Aliexpress are another factor driving this growth.

The Covid-19 pandemic has opened a strong window of opportunity for e-commerce. More and more people are driven to stay inside for their own safety - this is particularly true for the populations that are especially vulnerable to the disease. The lockdowns enforced across the world saw the closure of all but essential stores, leading people to do their shopping online
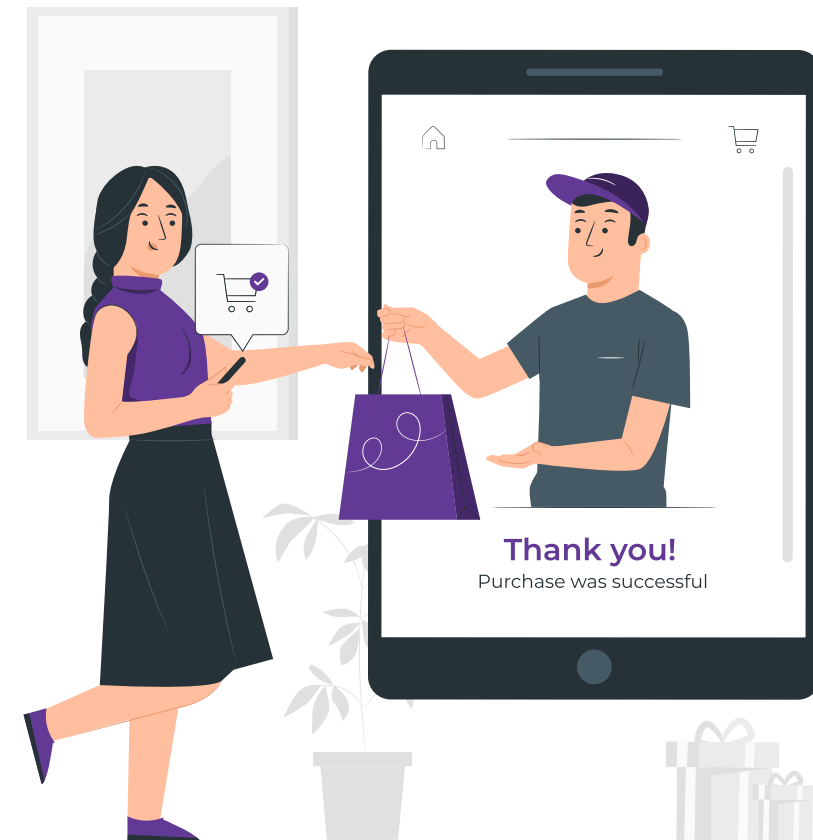
instead. Furthermore, many shops simply had to move to selling their goods online, or they would risk bankruptcy. This extraordinary sequence of events has also seen some innovations in the e-commerce sector. For example, Ukrainian start-up Liki24, which delivers pharmaceutical goods to peoples' houses, saw revenues dramatically increase during the period. Halfway through 2020, the company managed to raise 4.2 million euros in funding for its planned European expansion.

E-commerce has also been growing in the more developed countries of the region, like the Visegrad Four. Czechis had one of the highest number of online stores per capita - over 40 thousand as of 2017. This sector raised some 4.4 billion euros in 2019 and was projected to grow at an annual

rate of 16 per cent. The bulk of transactions in the country were made from local services, such as alza.cz and mall.cz. Cross-border purchases amounted to only 15 per cent of online purchases. Poland likewise has a bustling e-commerce sector. In October 2020, the Polish e-commerce service Allegro, riding the wave of its post-covid surge in sales, became Poland's biggest listed company, reaching a valuation of just under 16 billion euros.

In the Balkans, Croatia leads in the highest proportion of e-commerce users, with over half of the population estimated to have made purchases online in 2020. Montenegro trails the rest of the Balkans. In the highly-digitised Baltic countries, e-commerce has also been growing. In 2019, China set up an e-commerce hub in Latvia, greatly easing the process of

sending goods internationally. Local services dominate e-commerce sales in all three of the Baltic countries, indicating the strength of domestic tech companies.

In the Caucasus, the sector is a little more underdeveloped. As of 2019, over a third of Armenians and Georgians didn't have internet access. Furthermore, the kinds of robust postal services required to facilitate the delivery of goods is lacking in many parts of these countries, particularly rural areas. Nevertheless, the Armenian Central Bank recorded a 30 per cent increase in e-commerce transactions from 2015 to 2016. Meanwhile, Azerbaijan's fledgling e-commerce sector nearly trebled between 2015 and 2017. In 2018 in Kazakhstan,

e-commerce accounted for 2.9 per cent of all retail turnover, up from 1.3 per cent the previous year.

Although e-commerce is growing across the board in the countries covered, there are still some common limitations which mitigate growth. In many of the countries surveyed, cash transactions remain the most popular. Retirees often get their pensions in cash, as do other people receiving social welfare. Large parts of the population also seem not to be entirely trustful of paying by card on the Internet. While it is possible to pay cash for online transactions, this slows the whole process, thus limiting a company's capacity to move as quickly as it would like. Banking penetration remains not-universal

in much of Eastern Europe and the Caucasus.

Covid-19 and its after effects will certainly play a big role in the future of e-commerce. Now, with many shops moving online, there is a greater level of institutionalisation of this sector. As postal, road and internet infrastructure continues to develop, e-commerce will certainly follow suit in these countries.

Thank you!
Purchase was successful

E-COMMERCE
The future is now, but are you ready?

To the surprise of nobody, Covid-19 has had a huge, mostly positive, impact on e-commerce.

While retail is expected to underachieve again this year, online shopping is estimated to reach a worldwide total of 4.2 trillion US dollars by the end of this year, according to eMarketer.

With e-commerce growing as the dominant source of revenue, competition will be fierce, especially in Europe and North America, where we expect the biggest surges.

To meet the challenge, companies need to adapt in three key areas.

Firstly, they need to adapt to their audience – we're seeing different trends in various age groups and markets.

Secondly, they must adapt their business models – primarily in shopping and delivery – while thirdly, they should adapt their digital channels – as simply "being online" is no longer enough.

Notably, we're seeing new market segments enter into online shopping, such as senior citizens – according to Eurostat, over half of this group now purchase online, and the number of senior online shoppers is growing.

This in turn impacts the respective businesses: pharmacies, groceries and other operations that relied on in-store shopping or pay and collect models now need to broaden their horizons.

NATIONAL AND INTERNATIONAL BUSINESS

The wider your chain, the more likely you are to be based in shopping centres. Even when open, statistics show public hesitation lead to decreased sales. Such businesses need to get online and establish convenient alternatives. The knock-on effect here comes in increased warehouse demand and pressure on back-office systems, rather than front-of-store operations.
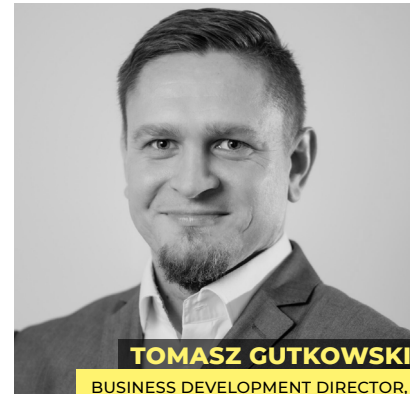
When it comes to local stores, the reverse is true. People are shopping locally to avoid high-risk areas, but it's not an immediate win. Convenience here is essential. Click and collect, deliveries and other methods that minimise further risk and exposure will go a long way.

For smaller businesses, third party integration with local providers – while still maintaining the best customer experience – is essential. Choose your business partners, and technology, wisely! As central remote shopping and deliveries become paramount, companies like Ocado are investing more heavily in warehousing and distribution – a trend seen in all countries.

NO TIME FOR COMPLACENCY

As for online stores – which will still define the major part of all online business - now is not the time to be complacent.

Increased competition means the need for clearer information, simpler ordering systems and better product images – anything to help improve the customer experience. The ability to go elsewhere gives power to the shopper so a proactive rather than reactive approach will keep them happy.

In any case, digital channels are the key to convenience, and convenience is the key to success.

On that note, don't forget mobile, either.

Global trends have long shown that mobile is readily outgrowing desktop usage – in fact, it has done since 2014, according to Statista.

Even with lockdowns, mobile convenience cannot be overstated.

TOMASZ GUTKOWSKI
BUSINESS DEVELOPMENT DIRECTOR, UNITY GROUP

★ ★ ★ ★ ★ 23 Reviews
$ 40.80
+ ADD TO CART

unity GROUP

< Digital Potential . / Fully Realized >

Webstore

Spryker   Magento 2

shopify   Xperience. by Kentico

PIMCORE   akeneo

Product Information

Order & Warehouse Management

Mobile Support

Scalable Architecture

aws

NEW YORK / ZURICH / WROCLAW / KRAKOW

contact@unitygroup.com   +48 71 358 41 00

unitygroup.com

GAMING FROM OUTSOURCING TO CREATIVE INNOVATION

The success of video gaming developers from emerging Europe is as good a sign as any that the region is moving fast up the ICT value chain.

Western Europe, the United States, and Japan have long been synonymous with the video game industry. But, in the last few years, many countries in the CEE region, Poland especially, have begun to upset this paradigm.

Over the last 15 years or so, the region has been shifting from being an outsource destination for western gamedev companies to a powerhouse of original creativity by leveraging the know-how gained from outsourcing and the comprehensive STEM educations that many CEE countries offer.

Building on this, developers and publishers in CEE have been able to produce video games that have enjoyed both market and critical success.

In Poland, CD Projekt, the large-scale dev and publisher behind the runaway success roleplaying game series **The Witcher** - which sold a combined 50 million units as of May 2020 - has become one of the country's largest companies — second to only the energy concern PKN Orlen. Smaller independent studios and the mobile sector have had a lot of success too.

These factors all indicate that the Polish video game industry is no longer emerging or maturing. It is already mature, and the level of differentiation present within the industry is proof of that. Just like in the West, Poland has large-scale producers who make big budget titles, a host of independent studios working on game at a time, and a bourgeoning mobile game sector.

But, while Poland is definitely the main video game hub in CEE right now, with a market worth 447 million euros, it is not the only country that has been successful in the field.

In 2019, the Estonian game studio ZA / UM swept the awards circuit with their twisted take on detective stories **Disco Elysium**. It's a good start for Estonia, which while a leader in IT, has not yet made a name for itself in the gaming sphere.

Belarus too is on the map thanks to Wargaming and their online multiplayer hit **World of Tanks** which currently has more than 150 million active players worldwide, and has made its CEO Victor Kislyi a billionaire.

In Czechia, according to the statistics portal Statista, the gaming market revenue is projected to hit 121 million euros in 2021, and to grow to 157 million euros by 2025.

Kingdom Come: Deliverance, a roleplaying game set in 15th century
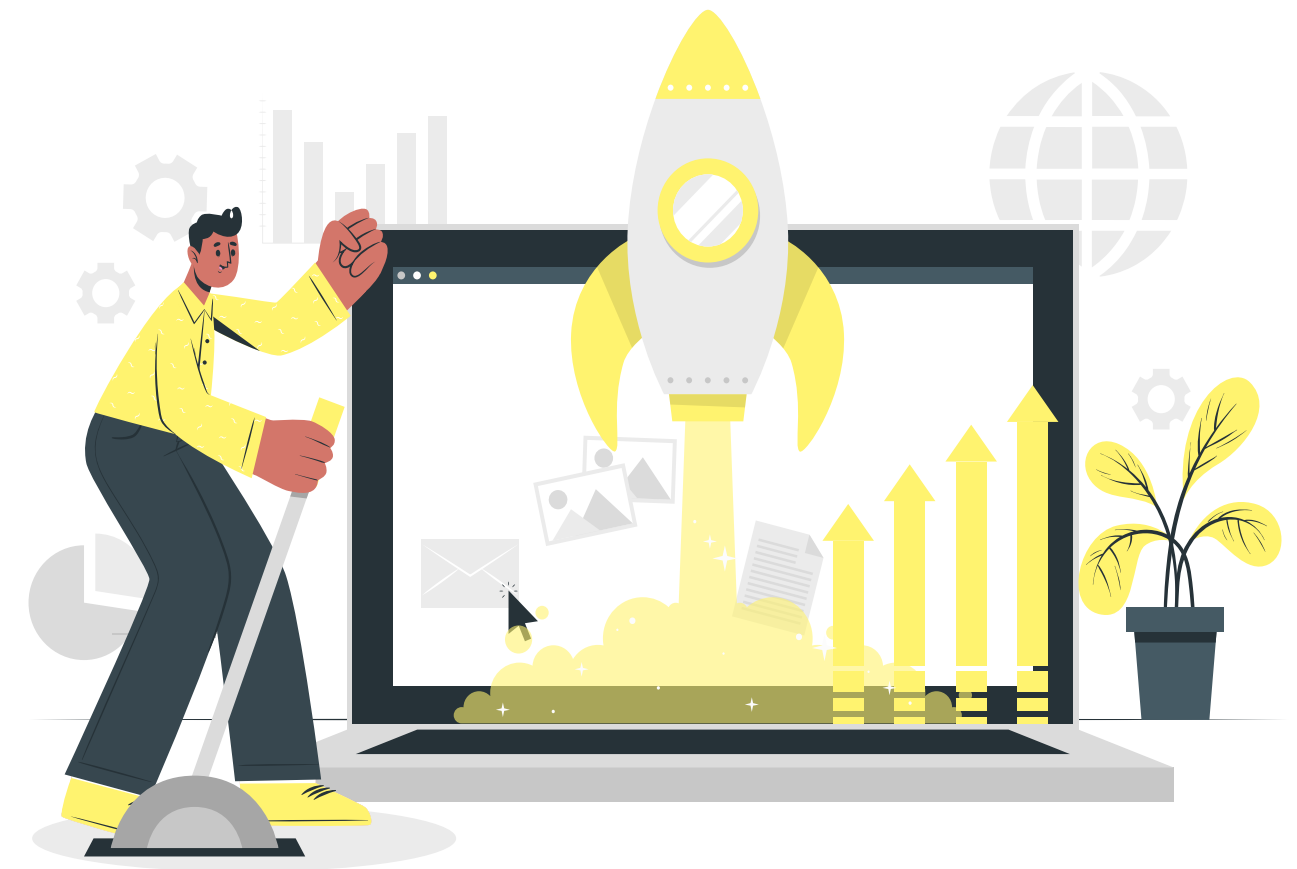
Bohemia, developed by the Czech gamedev Warhorse Studios, has managed to move three million units since its release in 2018. These are very encouraging numbers for the maturing Czech industry.

Elsewhere in the region, the gaming market and industries are in various phases of evolution. What is important is that nearly all countries have had some kind of success, even if it is limited to only a few notable games coming out from the country.

Hungary and Romania are still mostly focused on outsourcing, but notable games have come out of the two countries. In Hungary, Zen Studio has seen international success with the **Zen Pinball** series and in Romania Angry Mob Games' **Brawlout** sold more than 50,000 copies on the Nintendo Switch.

According to Statista, revenue in the game segment in Hungary is projected to reach 86 million euros in 2021, and to grow to 123 million by 2025.

In Slovenia, Outfit 7 has dominated mobile sales charts with their edutainment game **My Talking Tom**. At the other end of the spectrum, Triternion's competitive online fighting game Mordhau has managed to sell over 500,000 copies in just one month following its April 2019 release.

Croatia, long represented by Croteam, the developer behind the **Serious Sam** series, is also finding success in the mobile area through Pine Studio's well-received puzzle games such as **Faraway: Puzzle Escape**. Indie studios are becoming noticed too, with the American publisher Devolver Digital picking up Binx Interactive's **I Hate Running Backwards** in 2018.

According to data from Statista, the video game market revenue is expected to reach 53 million euros this year in Croatia.

Even in the Western Balkans, companies are becoming noticed. Serbia's Ebb Software scored a deal

with Microsoft for their H.R. Giger-inspired first-person shooting game **Scorn** to become exclusive to the Windows platform and the Xbox series of consoles.

Last year, a small two-person studio from Bosnia and Herzegovina, AI Interactive, got their puzzle game **The Enchanted World** featured on the exclusive Apple Arcade mobile platform.

One thing is clear, the CEE region has the know-how and the talent to become the next major game industry hub. The number of foreign companies who outsource to the region is proof enough of that. But for the region to truly shine, developers in most countries will need the support of governments and investors to shift away from the outsourcing model and strike out on their own, just as Poland did.

WHY GAMING IS SET TO BECOME POLAND'S NATIONAL BRAND

Poland has long been a cultural powerhouse. The birthplace of no fewer than six Nobel Literature Prize laureates (most recently Olga Tokarczuk in 2018), the country can also boast a giant of science fiction – Stanisław Lem – and one of the world's greatest ever film directors, Krzysztof Kieślowski. Today, however, the country's most valuable cultural export is a most contemporary phenomenon: video games.

In 2019, video games passed an important milestone when worldwide revenue eclipsed that of Hollywood for the first time.

It's been a long journey for the industry, from nerd obsession to mainstream entertainment, which along the way has stoked much debate as to whether or not video games can be considered an art form. Now with their own category at the BAFTA awards, rigorous scholarly criticism, and the kind of cultural cachet previously reserved only for "serious art", the debate appears to have been put to one side for good.

For a long time, the video gaming industry coalesced around three major hubs — North America, Western Europe, and Japan. Publishers from the United States, the UK, France, and Japan were the largest and most powerful, taking what appeared to be an unassailable lead in this emerging, booming industry.

In recent years, however, this has changed. Developers from emerging Europe have stormed the market, creating some of the world's most innovative and best-selling games, creating a phenomenon that brings in not just export revenue, but boosts the cultural recognition of an entire region, branding it as the home of cutting-edge gaming.

Poland, as it so often does, has led the way.

"The CEE region has been able to capitalise on its strong mathematics and engineering education and expertise to offer highly skilled workers for the games industry," says Dr Jennifer Johns, a lecturer at the University of Bristol, and

an expert in economic geography. "Poland in particular has developed into a significant cluster, using initial links to overseas developers to significantly develop indigenous capacity."

THE WIG GAMES INDEX

So important is the gaming industry for Poland that in 2019 the Warsaw Stock Exchange (WSE), the largest in the region, launched an index dedicated to it, the WIG Games Index, part of the exchange's strategy to attract technology companies.

"The listing of regional gaming companies on the WSE is a brilliant strategy," says John Lawrence, chief investment officer at J.A. Lawrence Wealth Management. "This is a purely global play for Poland. Gaming itself is a global hobby shared all over the world. Listing these companies will continue to pull global investment into Poland."

By the end of 2020, the number of gaming companies listed on the WSE had risen to 54, the most in the world, beating out the previous leader, the Tokyo Stock Exchange.

"This shows the importance of the game development segment for the Polish capital market, and why we were prompted to create the WIG Games Index," Marek Dietl, the WSE's CEO, tells Emerging Europe.

According to Krzysztof Kwiatek, the CEO of Creepy Jar, one of the gaming companies listed on the WSE whose independently-produced Green Hell has found a successful home – and player recognition – on the Steam digital storefront, Poles have always liked video games.

"The economic transformation after 1990 opened the door for people who wanted to make such games themselves," he says.

So successful has Poland been that critically-acclaimed titles from the country are no longer the exception, but the rule.

"Rather than a single one-off success, Poland's creative industries are delivering a growing catalogue of highly-regarded titles that an audience of international gamers enjoy," Joost van Dreunen, video game expert, lecturer at NYU Stern, and author of One Up: Creativity, Competition, and the Global Business of Video Games tells Emerging Europe.

GAMES AS LITERATURE

Titles from Poland that have sold millions of copies around the world include CD Projekt's behemoth role-playing game brand The Witcher, and This War of Mine from 11 bit studios, a strategy game set in an occupied city (loosely inspired by
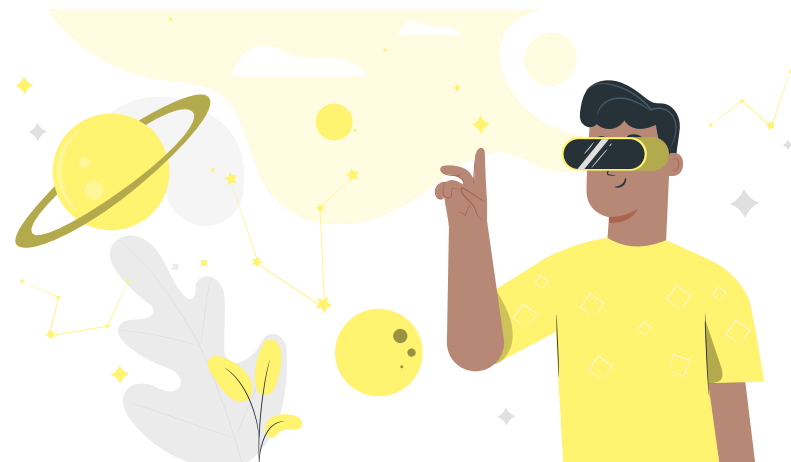
the Siege of Sarajevo) that focuses on ordinary people surviving against terrible odds. It has become both an indie darling and achieved recognition as an important entry in the canon of anti-war art.

So important, in fact, that it is now being taught in literature classes in Polish schools.

"When all puzzle pieces like gameplay, emotions, mood, and aesthetics started to make a consistent picture, we felt we had a unique title on our hands," says Konrad Adamczewski, PR lead for 11 bit studios. "The overwhelmingly positive global reception of This War of Mine, resulting in rising interest from more prestigious and mainstream media outlets and newspapers, proved we were right, but we did not expect that huge interest."

What 11 bit studios did with the game is perhaps one of the best indicators that succeeding in the field of video games is not just about the money. With games now being a mainstream form of entertainment possessing actual artistic currency, countries that do well have a chance to export their culture to a global audience.

"It is more than the economy. It is our cultural heritage," Mr Adamczewski adds, "even if our games don't focus on Poland or are not set here. [Grand Theft Auto] is now part of the UK's cultural heritage despite being set in the US. Poland is proud of its games and finds them being more than entertainment."

LONG WAY TO GROW

With so many active game development studios (over 400 according to recent industry reports) and so many people in the country identifying as gamers (nearly half of its 38 million population), experts believe that the industry still has a long way to grow.

"Where even just a few years ago Poland played a more passive role as a place to outsource software development, it has since then found its own voice. From their humble beginnings, Polish game makers have grown into a creative and cultural force," says Mr van Dreunen.

But what do these successes mean for the country at large, especially on the world stage?

Will Poland be known from now on as a country that good video games come from?

Experts from the industry Emerging Europe talked to are in broad agreement on this.

"I feel that this might indeed be the case," says Marek Markuszewski, CEO of Starward Industries, another independent studio that is currently working on turning Stanisław Lem's novel The Invincible into a video game. "I saw a headline the other day that said Poland had overtaken Japan when it comes to the number of game studios it has. If someone told me this 10, 15 years ago, I would have told them that they're nuts."

Paweł Marchewka, CEO of Techland, one of the biggest development and publishing companies in the country, concurs. "We have lots of studios in Poland and highly talented developers," he says. "Therefore it is not surprising that a lot of great video games are made in Poland and game development has definitely become a brand for our country."
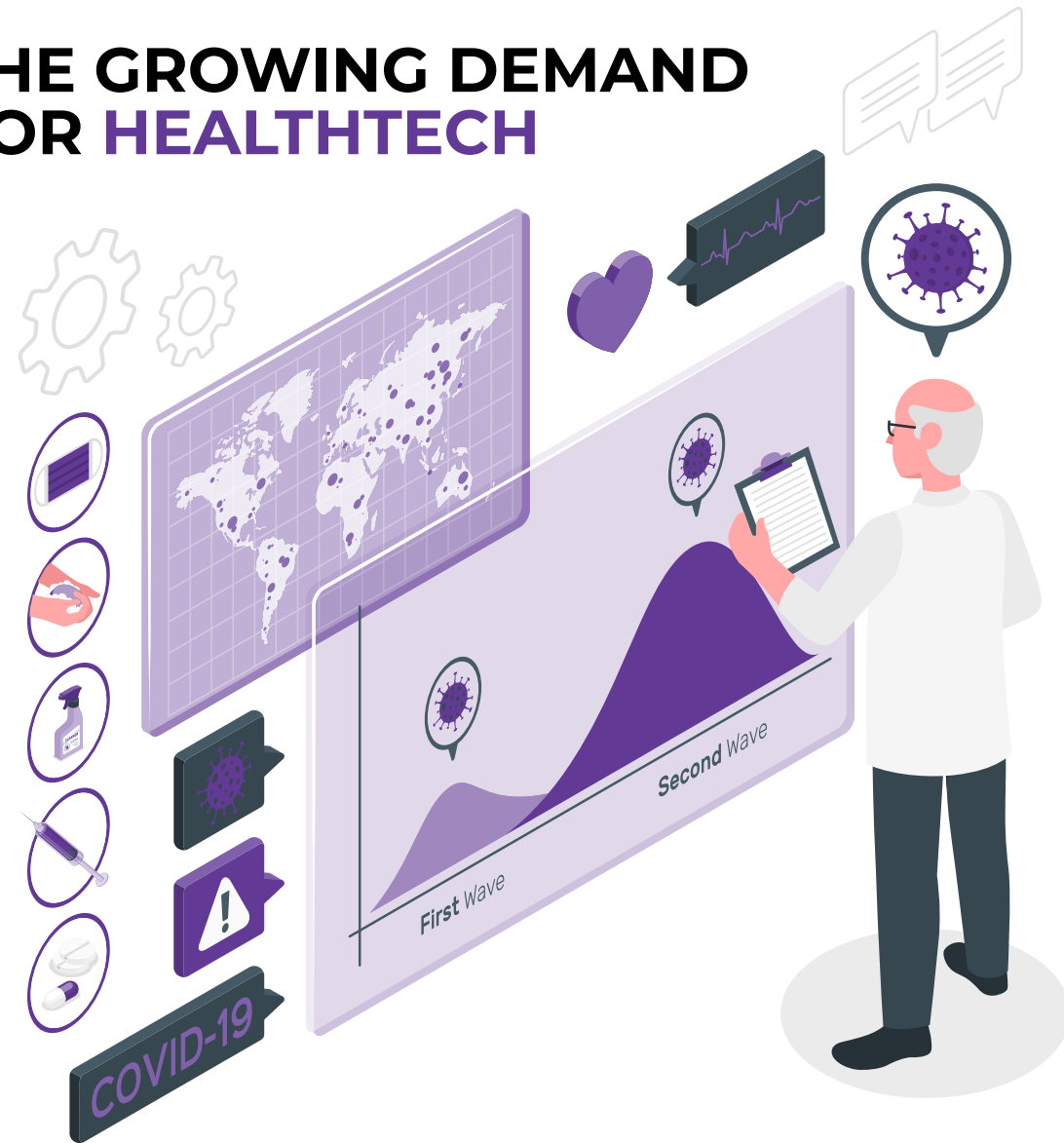
THE GOVERNMENT TAKES NOTE

Of course, the best proof of this lies with the gamers themselves. On the popular discussion site Reddit, the community dedicated to the game The Witcher III has more than 150,000 members, where fans share memes, fan art, cosplays and more. Meanwhile, Bloober Team's recently released horror game the The Medium sold so well that it broke even just days after being released on the PC and Xbox platforms.

The video game industry – and the medium itself – are inherently global, and more than 90 per cent of games produced in Poland are played outside of the country. The Polish government has taken notice at the possibilities this offers for nation branding and has doled out more than 300 million złotys (around 66.7 million euros) through an EU-funded programme to help small studios get their projects off the ground.

"When it comes to game development the right amount of support from the government and adjacent industries will ensure there are few obstacles toward Poland becoming a world-leading nation in gaming," Mr van Dreunen notes.

That the Polish video game industry has matured is now a foregone conclusion. Now it's up to all stakeholders to turn that recognition and market success into a genuine national brand that will fuel the next stage of development and make Poland synonymous with high-quality digital entertainment.

Not for the first time, a perfect mix of innovative creatives, capital market backing and government support means that Poland appears to be uniquely positioned to take advantage.

THE GROWING DEMAND FOR HEALTHTECH

Healthtech, or medtech, is defined as the application of technology - be it through devices, software, apps, procedures - to health systems. Healthtech in Europe so far has been concentrated in a few Western European countries, like the UK, Switzerland and Germany. However, recent years have seen a quick growth in this sector in Eastern Europe and beyond.

There are several interconnected factors that explain this growth. Throughout Eastern Europe, demand for private healthcare has been growing fueled by higher salaries and widespread budget cuts to previously robust public healthcare systems, which have led to long waiting lists, understaffed hospitals and poorer quality service, pushing people to look for alternatives in the private sector.

Some countries have pursued widespread privatisation of health services — Latvia, for example, spends under six per cent of its GDP on healthcare, compared to 11.2 per cent for France.

Another factor driving the demand for healthtech in emerging European countries is the ageing populations. As these countries develop, life expectancy goes up, along with the median age. This is exacerbated by low fertility rates - while it is common for fertility rates to decline as a country develops, in many of the countries in this region, fertility rates remain below replacement levels. All of this drives up the average age — and consequently the demand for healthcare. Ukraine, for example, has had its population drop from a peak of 51 million in the early 1990s to just under 42 million in 2020. The median age has gone up in the same period from 35 to 41. Over 20 per cent of the populations of Latvia, Serbia, Croatia and Bulgaria are aged 65 or older.

Healthtech has the potential to create widespread changes in the health sector across the region. The application of technology can help the less developed countries of the region catch up quicker to the West - and there are still many areas where they need to catch up. Take life expectancy, for example - in Moldova and Ukraine, men's life expectancy is at 68 and 67 respectively, lower than in many African countries.

The Covid-19 pandemic has given the healthtech industry a strong boost as innovative companies capitalised on the challenges raised by the crisis to find innovative solutions. In Hungary, healthtech company Resysten moved quickly. As early as March 2020, when there were fewer than 100 confirmed cases in the country, Resysten developed a coating which reacts with sunlight to kill pathogens on surfaces. In November 2020, Resysten signed a deal with one of the biggest mass transit companies in Hungary to coat all the company's vehicles with its solution.

The Covid-19 pandemic has also led to fewer people taking the risk of going to the doctor for trivial matters - particularly in countries where the healthcare system found itself under severe strain by the virus. Polish start-up HomeDoctor stepped in to solve this issue, giving people the option of phone and online consultations, as well as arrange for a home visit from a doctor. By late 2020, HomeDoctor raised 3.7 million euros for further expansion. Ukrainian start-up Liki24 saw a similarly sharp increase in demand for its home delivery service for pharmaceutical items and raised five million dollars in funding in 2020.

Covid-19 also precipitated a shift in approach to healthcare, with the need for data-driven and value-based healthcare becoming more and more apparent. Data in particular can be vital in coming up with quick, innovative solutions to actively developing issues, like Covid. EU-backed group EIT Health has consequently been active in laying the legal and regulatory groundwork for innovative solutions to be tested, as well as financing potentially innovative solutions which traditional health systems tend to be slow to move on.

Innovations in healthtech have also happened outside the Covid window. In Kazakhstan, a remarkable start-up Sezual has developed a Braille self-tutor. Even more excitingly, following World Bank recognition, Sezual is developing a device which can help blind and visually impaired persons have vastly improved awareness of their surroundings through echolocation - essentially making the blind see. In tech powerhouse Estonia, Transformative, a software which can help track and predict sudden cardiac arrest, raised 1.7 million dollars in funding in 2020.

There are similar issues slowing the spread of healthtech in emerging Europe as with other sectors of technology. Internet penetration remains relatively low in many countries. The health industry as a whole is often tightly regulated and dominated by the public sector. Taxes remain high in much of the region, with several countries not offering special tax regimes for tech companies and start-ups. Corruption remains an ever-present spectre.

Furthermore, the recent shift to data-driven public health responses creates a problem of privacy, where many may be wary about whose hands their personal and sensitive data fall into. However, the undeniably positive economic trajectory of most of the region bodes well for a continuation in innovation in healthcare along with a growth in demand for healthtech.

INNOSTARS AWARDS 2021

FOR THOSE DEDICATED TO IMPROVING HEALTHCARE

★ ★ ★ ★ ★ ★

INNOSTARS AWARDS IS ONE OF THE FLAGSHIP PROGRAMMES OF EIT HEALTH INNOSTARS, WHICH HELPS TO CONVERT HEALTHCARE IDEAS INTO VIABLE ENTERPRISES.

APPLICANTS ELIGIBLE TO REGISTER ARE MICRO- AND SMALL ENTERPRISES, SPIN-OFFS AND START-UPS THAT ALREADY HAVE A PROTOTYPE OR MINIMUM VIABLE PRODUCT, BUT DO NOT YET HAVE A PRODUCT OR SERVICE ON THE MARKET. THEY MUST COME FROM THE FOLLOWING COUNTRIES: ALBANIA, BOSNIA AND HERZEGOVINA, CROATIA, CZECH REPUBLIC, ESTONIA, GREECE, HUNGARY, ITALY, LATVIA, LITHUANIA, MACEDONIA, MONTENEGRO, POLAND, PORTUGAL, ROMANIA, SERBIA, SLOVAKIA, SLOVENIA AND SPAIN.

THE PROGRAMME IS DESIGNED TO HELP START-UPS VALIDATE THE NEED FOR THEIR HEALTHCARE INNOVATIONS, ATTRACT INVESTORS AND SHORTEN THE TIME IT TAKES TO GET IDEAS TO THE MARKET.

BENEFITS:

- € 25,000 SMART MONEY OR MENTORING WITH € 4,000 VALUE
- INDIVIDUAL MENTORING FOR FOUR MONTHS
- INVITATION TO THE INNOSTARS FINAL PITCH EVENT
- ACCESS TO EIT HEALTH'S LIVINGLABS AND TEST BEDS NETWORK
- ACCESS TO EIT HEALTH'S INVESTOR NETWORK
- TRAININGS
- INSIGHTS ON YOUR INNOVATION THROUGH INTERWIEVS WITH POTENTIAL CUSTOMERS, INVESTORS AND PARTNERS

APPLICATION DEADLINE: **27 MARCH 2021**

PROGRAMMES ARE ONLINE AND FREE

EIT HEALTH IS A VAST, VIBRANT COMMUNITY OF THE WORLD'S LEADING HEALTH INNOVATORS, BACKED BY THE EUROPEAN INSTITUTE OF INNOVATION AND TECHNOLOGY (EIT), BODY OF THE EUROPEAN UNION.

Working across borders and disciplines with approximately 150 partner organisations, EIT Health harnesses the brightest minds in healthcare from the worlds of business, research and education to answer some of the biggest health challenges facing Europe.

Through this unique collaborative approach, the organisation is empowering a network of innovators to overcome barriers, challenge convention and take action.

With the mission of transforming healthcare in Europe, EIT Health launched more than 55 innovative products and services, educated thousands of students and professionals as well as supported more than 740 start-ups from medtech, biotech and digital area since 2016.

LEARN MORE AND JOIN US: **WWW.EITHEALTH.EU**

THE REVOLUTIONARY POTENTIAL OF GOVTECH

Govtech is an exciting new frontier which has the potential to revolutionise the dynamic between government and people.

Govtech is defined most simply as technology for public sector applications; essentially any technology which makes government services more innovative, responsive, efficient. While still in its early stages, breakthroughs in certain countries point to an exciting future where the interaction between the government and the public will be done in an efficient manner, online. In most of the countries covered in this region, govtech is still in its infancy — however the potential benefits are nothing short of revolutionary.

The number of people in those emerging Europe countries which are EU member states (EU-11) who have accessed at least one online service has risen by 15 percentage points since the start of the Covid-19 pandemic, according to the Covid-19 Digital Sentiment Insights survey by McKinsey & Company.

At the peak of the pandemic, there were almost 12 million new users of online services – more than the populations of Slovakia, Croatia, and Slovenia put together. Prior to the pandemic, 61 per cent of consumers used digital services; following the lockdowns imposed in various countries, that figure had grown to 76 per cent.

The 2019 digital economy in the EU-11 was roughly two per cent above the previously forecasted 2019 "business-as-usual" scenario, reaching a value of around 94 billion euros. However, CEE countries achieved only 80 per cent of the target levels in an "aspirational scenario". In light of the rapid migration of consumers to digital technologies driven by the Covid-19 pandemic, the region has an opportunity to capture the momentum for future growth. Embracing digital technology in the coming years may accelerate digitisation of the region.

The survey reveals rapid digital adoption by all age groups and geographies, not just traditional "early adopters" – young professionals living in large cities. Younger generations (people aged 18–44) led the way with regard to digital adoption in all the EU-11 countries, both before and after lockdowns were imposed. But the digital adoption rate also grew significantly during lockdown for consumers aged over 65, a group whose increased level of medical risk creates a strong incentive to access services online. In fact, this age group showed the strongest growth across the region, with the number of users increasing by 40 per cent.

Govtech can go a long way in boosting those numbers further. Streamlining public administration processes can make the government more efficient, which can restore a sense of trust from the public. Connecting the government to the public through the internet or cloud can also vastly improve transparency, accountability and good governance, all vital elements in the development of a democracy and stable civil society.

The introduction of electronic voting has the potential to greatly increase voter participation and galvanise previously apathetic citizens. Furthermore, the simplification of public functions can also save the state in question significant sums of money, freeing up funds to be used for more pressing issues.

The Baltic States are further ahead in govtech than any other region covered in this report. In fact, these are some of the most advanced states in the world in terms of govtech and e-governance. Estonia has been leading the way in particular - the nation introduced electronic ID cards as far back as 2002. Since then, over 600 government functions have become accessible to the population online.

Voting, paying taxes and utilities, signing contracts, making bank transfers, applying for welfare - all of these vital functions can be done with the click of a button, hugely simplifying the processes. These innovations have reportedly saved the state two per cent of its GDP, freeing up vital resources from administrative trivialities. Lithuania is looking to follow suit through the establishment of its Govtech Lab, where new innovations and technologies can be trialed and tested. During the Covid-19 pandemic, the governments of Estonia and Lithuania deployed innovative methods to combat the virus, like using automated chatbots to answer concerned citizens' queries.

Elsewhere in emerging Europe, govtech remains in its infancy. Serbia is somewhat of an exception, having launched an e-government portal in 2010. Now, Serbian citizens can access 800 government services through the portal. The government reported that the portal has over a million active users, out of a population of just under seven million.

Kazakhstan briefly experimented with e-voting in the early 2000s, but discontinued it after claiming the public prefers paper and political parties do not trust the system. Armenia has been looking to continue its recent ICT development by launching the Govtech Launchpad, similar to Lithuania's Govtech Lab.

However, there are deep-seated factors which may limit the spread and growth of govtech. In many countries, there may be powerful political factions for whom transparency and accountability is not in their interest. Corrupt administrations across the region have reason to fear any innovations which may lay bare their illegal activities. Furthermore, some governments may express valid security concerns around govtech - this is a particularly pertinent issue for govtech companies to address. Sensitive internal data about a country can be compromised if it is all online. E-voting can be easily manipulated if implemented in a country with weak or unstable democratic institutions.

Despite these issues, however, govtech seems to be a solution to many political and administrative problems. Govtech has the capacity to create truly fruitful public-private initiatives which benefit the entire population of the country - in safe, competent hands, its potential for good is vast.

THE IMPORTANCE OF E-MOBILITY

W ith the spectre of global warming casting a shadow over the entire world, the need for more environmentally-friendly solutions has never been more pressing. This has driven the growth of the e-mobility industry, particularly over the past decade. E-mobility refers to any technology which allows electrical propulsion of cars, buses, scooters and trains.

Today, the public is more environmentally-conscious than ever before. Governments have also followed suit and recognised the enormous implications of the current rate of climate change. Reflecting this, in 2019, the European Commission unveiled the European Green Deal, a set of policy initiatives carrying the overall goal of making the entire European Union climate neutral by 2050. This also targets a 55 per cent reduction in greenhouse gases compared to the 1991 level.

Such initiatives, in conjunction with the increasingly urgent need for solutions to the currently unfolding climate crisis have opened a big window of opportunity for the e-mobility industry.

Electric vehicles are by orders of magnitude more environmentally-friendly than regular motor vehicles. In emerging European countries, there is particularly vast space for growth for the e-mobility market

and wide-reaching benefits. Automobile ownership rates are lower in the region than in the rest of Europe, meaning there are less people who are used to motor vehicles and are unwilling to make the switch to electric. Furthermore, breakthroughs in e-mobility in public transit systems like trains and buses can go a long way in alleviating mobility issues caused by the relatively underdeveloped infrastructure in much of the region.

A huge potential benefit for the nations of emerging Europe in the widespread adoption of electric vehicles is how this lessens the dependence on oil. Oil has rapidly fluctuating and changing prices. Furthermore, the vast majority of countries covered in the region do not have their own oil resources. This makes them dependent on outside providers - and with the ubiquitousness of oil, this dependence can take the form of submission to the whims of the oil providers. Electrifying a country's vehicles will take away this dependence on oil, thus freeing up countries to act more independently and become more self-sufficient - each of these countries produces its own electricity and has the capacity to produce more.

The Visegrád Four - Poland, Czechia, Slovakia and Hungary - have already made impressive progress in e-mobility. Czech car manufacturer Skoda in 2019 unveiled the Skoda Superb, the first plug-in hybrid electric vehicle made in the country. It also announced plans to make another five models by 2025. Poland's nationalist government has supported plans to produce its own electric car, the Izera, by 2023. Furthermore, Europe's largest electric bus producer, Solaris, is based in Poland, and boasts a 25 per cent market share. Its vehicles are also being exported to other countries, including Germany, Italy and Sweden. Poland also exports electric golf carts to over 20 different countries, while Polish electric

scooter service blinkee.city operates in eight countries across Europe.

Aeromobil, a Slovakian start-up has even more extravagant ideas: in 2019, it raised 20 million dollars in funding to continue developing a flying electric car. French-owned Romanian car manufacturer Dacia meanwhile has promised its electric car, the Dacia Spring, will be the cheapest electric vehicle available on the European market, with production for it based in China.

In the Baltics, Lithuania's Elinta Motors in 2020 unveiled an electric minibus to be used for public transportation. Estonia is home to Bolt - what started as an electronic scooter service in 2013 and currently operates in over 40 different countries. Demand for electric cars has been soaring in Eastern Europe. In late 2020, Belarus's energy ministry announced that the number of electric cars in the country had doubled in a six month spell. Ukraine has seen even more dramatic changes - between 2018

and 2020, the number of electric cars has gone up by 375 per cent.

However, the Balkans are still lagging behind most of Europe in electric vehicle ownership - Croatia records the lowest total in the European Union with just 730 electric cars on the roads. Non-EU Serbia records just 102 in total. Furthermore, the Covid-19 pandemic has seen double-digit decreases in demand for electric cars throughout Europe, although this is in conjunction with the drop in demand for regular cars.

Previously, a big barrier to the growth of the electric car market in the region has been the cost - electric cars are more expensive to buy than their fossil fuel equivalents, even if they save money in the long-term. However, this issue is quickly fading with the quick decrease in prices of electric car batteries. In 2020, Slovakian car battery manufacturer InoBat announced a strategic partnership with German giant Manz, which looks set to give

a big boost in competitiveness to the European electric car market and lessen the dependence on battery imports.

The e-mobility sector is one which is almost guaranteed to see continuous growth in the coming years. The limitations of oil - it being finite, detrimental to the environment and subject to constant price fluctuations - indicates that over the next century, its use will continue to fade.

This presents an exciting opportunity to capitalise on a trend, as the electric car industry is still not fully mature. Furthermore, some countries in emerging Europe can be attractive nearshoring destinations for production of vehicles and vehicle components.
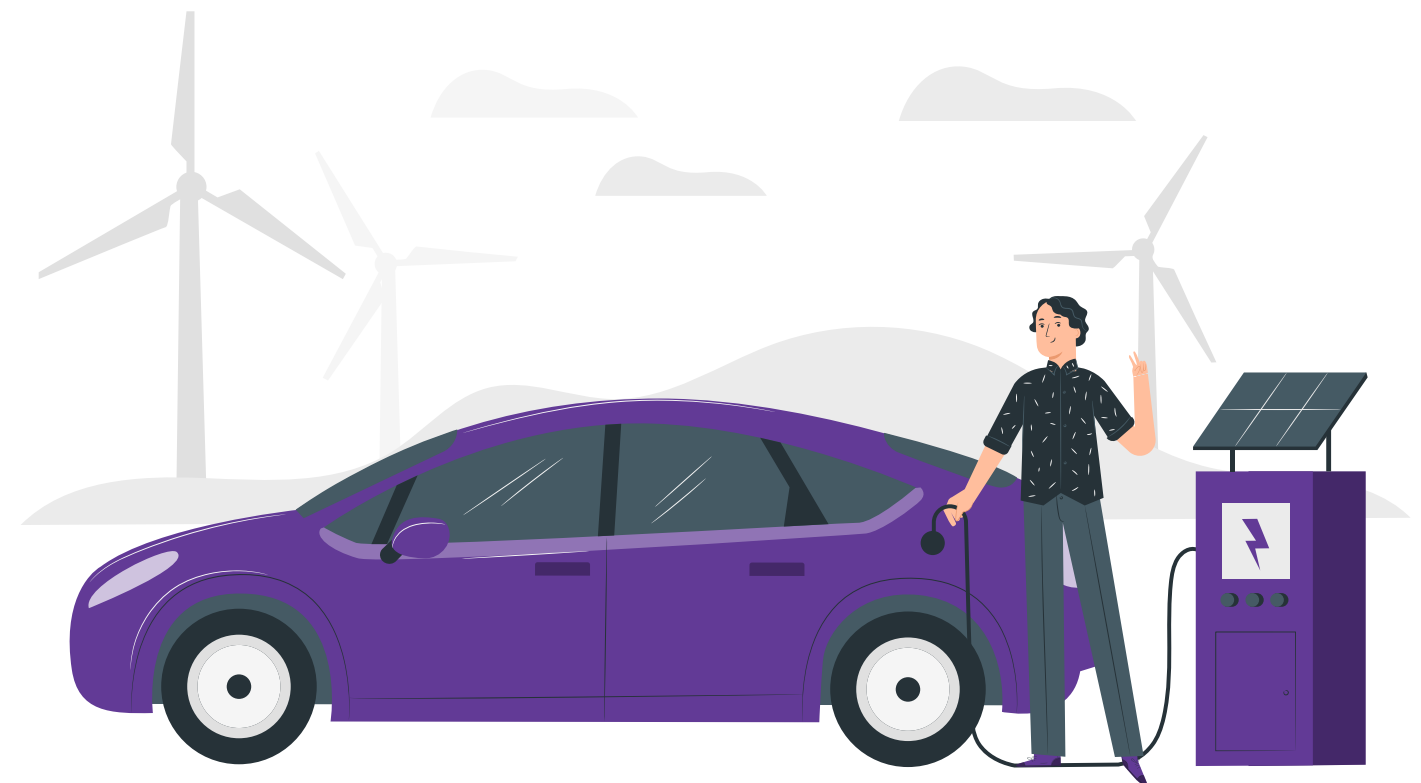
USING ONLINE B2B MARKETPLACES TO BUY IT HARDWARE AND ACCESSORIES

WORDS ANDRES AGASILD, CEO, MARKIT

In this article we look at three things: IT procurement predictions and trends for 2021, the role of marketplaces in buying IT hardware and accessories, and solving the dilemma of having more IT suppliers to minimise supply risk against reducing the number of suppliers to save time and money on supplier management and contractual/compliance obligations.

IT PROCUREMENT PREDICTIONS

In Markit's recent free report, How Key Procurement Predictions for 2021 Impact the Indirect IT Category, we listed the nine most frequently predicted trends for procurement in 2021:

• Technology touches even more aspects of business, leading to IT demand increases
• Continued economic uncertainty raises the focus on business agility, contingency planning and risk mitigation
• Trusted IT supplier relationships will become even more important
• Acceleration of IT procurement automation will lead to increased transparency and spend visibility
• Sustainable IT procurement initiatives increase to meet consumer and compliance demands
• HR departments will optimise more talent for adaptation, transformation and agility
• CFOs continue to minimise fixed costs and non-essential spend
• B2B marketplace usage continues to grow
• Shortening IT supply chains whilst solving the global v local consolidation dilemma persists.

ANDRES AGASILD
MARKIT CEO

THE ROLE OF MARKETPLACES IN BUYING IT HARDWARE AND ACCESSORIES

The Covid-19 pandemic has accelerated interest in, and adoption of, B2B marketplaces in various categories - including IT. McKinsey was one of the first to highlight how B2B marketplaces could transform indirect procurement in their 2019 report of the same name.

According to Digital Commerce 360 B2B (2020), 58.8 per cent of B2B buyers now conduct at least 25 per cent of their business purchasing on a marketplace, while according to Gartner, at least 70 per cent of enterprise marketplaces will serve B2B transactions by 2023.

McKinsey meanwhile found that by 2021, indirect spending will be led and directed by tech-procurement people at up to 60 per cent of large enterprises.

WHAT IS THE OPTIMUM ROLE OF AN ONLINE B2B MARKETPLACE IN IT PROCUREMENT?

The sweet spot for an IT device marketplace is where the products that are being bought are available in a wide variety of options, have a relatively low unit cost, have a high annual order count, and form a significant part of the total annual IT device spend.

In other words, where the aggregate savings potential is high. This is especially the case for IT accessories such as headsets, cables, and webcams etc.

In some scenarios, traditional tenders may still make sense for a large order of notebooks, but does it really make sense to tender frequent orders of low-cost items, especially those with variable specifications, such as cable lengths? No, it does not - quite simply the cost of the time taken plus the fact that that time could be put to better use.

We believe the time-wasting process of tendering IT accessories should be consigned to the past.

The explosion of choice and usage of IT accessories means the long tail has morphed into the body. The tail is wagging the dog! In some organisations, IT accessories can account for more than 40 per cent of indirect IT spend. Markit data also shows that the number of accessories ordered per computer has risen 83 per cent over the past 10 years.

As such, even if companies do not use marketplaces to buy all their IT devices, they certainly should for IT accessories. It just makes sense. The aggregate time and money savings on frequent orders of low-cost IT accessories are significant.

SOLVING THE DILEMMA

The pandemic has highlighted the issues and unpredictability of IT supply chains that stretch thousands of kilometres and the risk of supplier consolidation when a critical supplier was adversely affected.

But even before Covid-19 the local/global dilemma existed. The challenge is how to shorten supply chains, buy more locally and at the same time consolidate IT hardware and accessory purchasing for the obvious time and money savings that consolidation offers.

It is worth noting that Deloitte's CPO (Chief Procurement Officer) Flash Survey 2020 found 25 per cent of companies were consolidating and 47 per cent were expanding their supplier bases.

We propose that companies need to both expand and consolidate the number of IT suppliers at the same time. It sounds impossible but it is not - we addressed the dilemma in a report written for Procurement Leaders: The Indirect IT Procurement Dilemma – Solved. In it we showed how the single-vendor model for B2B marketplaces can give buyers the best of both worlds. We call it the Marketplace-as-a-Supplier solution (MaaS).

In 2021, more IT buying decision makers will seek a marketplace-as-a-supplier that can offer single-vendor, rather than broker, model. Demand will increase for "an IT supplier AND a marketplace all rolled into one" who is responsible for fulfilment, deliveries, and warranties on the products they sell.

> **"Even if companies do not use marketplaces to buy all their IT devices, they certainly should for IT accessories. It just makes sense. The aggregate time and money savings on frequent orders of low-cost IT accessories are significant."**
>
> ANDRES AGASILD, MARKIT CEO

MARKIT

Leading global B2B IT marketplace and procurement solution with fast delivery in 35 countries.

40% LESS TIME SOURCE-TO-PAY | **20%** SAVINGS ON BUDGET SPEND | **DELIVERY REDUCED** FROM 30 TO 2.5 DAYS

A growing number of Fortune 500 & Forbes Global 2000 companies are using Markit.

Danfoss SIEMENS TRIBOO

TALLINK ABB TransferWise

INNOFACTOR® telenor Mantu
TOMORROW IS HUMAN

S|E|B *Johnson&Johnson*

PROCUREMENT LEADERS
WORLD PROCUREMENT
AWARDS 2020

Markit integrates more than 300 leading IT distributors into the largest real-time & transparent online catalogue for IT products in the world.

World class functionality designed to save time and money for IT purchasing professionals.

WWW.MARKIT.EU/STORIES

Danfoss

ADDRESSED OUR CHALLENGES HEAD ON

"The Markit system gives us a single, simple and transparent, cross-border IT purchasing. Markit has consistently impressed us with their long-term business view, flexibility, quality of service and, most importantly, their ability to repeatedly deliver cost savings."

Claus Mikkelsen
Global Category Manager

hp

GLOBAL CO-OPERATION FOR 20 YEARS

"It is essential that clients with multinational operations and central control can be served in a professional and consistent basis in their local markets. Collaboration with Markit has run more than 20 years and we are confident that HP's values are extended through their service to our mutual clients."

Jari Niemisto
Sales Director Finland & Baltic countries at HP

TAKE THE **CHASING**
OUT OF IT PUR**CHASING**

CYBERSECURITY IN EASTERN EUROPE

As the world becomes more and more digitised, cybersecurity becomes an increasingly pressing need. The proliferation of ICT specialists throughout the world is something of a double edged sword - their knowledge and skills can also be used for illegal purposes. Companies risk losing huge amounts of money, people can have personal information stolen, and, more worryingly, government institutions can be compromised by ill-intentioned actors. This presents a demand in cybersecurity, both in the public and private sectors.

In Eastern Europe, this is particularly pertinent today.

The economic growth seen throughout emerging Europe in the last few decades has seen the expansion of corporate activity, and the proliferation of personal computer ownership, leading to a relatively recent increase in demand for cybersecurity. Furthermore, the development of the ICT industries in these countries has made cyberattacks become more sophisticated. Some estimates indicate that cyberattacks are the third biggest organised criminal industry in the world today.

There are strong, disturbing precedents for cyberattacks. In July 2020, the website of North Macedonia's state election commission was targeted on the day of polling during national elections. The year before, the National Revenue Agency of Bulgaria came under an unprecedented cyberattack which affected the personal data of as much as 70 per cent of the country's population. These attacks constitute not just a threat to the profits of businesses, but also legitimate geopolitical or even military threats to a country's security.

This is particularly concerning with the recent move towards e-governance in countries like Estonia - what should be a positive step forward for the country could end up exposing the country

to harm. Individuals are also vulnerable to cyberattacks, with personal data, private information and finances all at risk. This is particularly pertinent in some parts of emerging Europe, where individuals are also vulnerable to cyberattacks or monitoring by their own governments or other vested powers.

Covid-19 has also affected cybersecurity, as it has so many other facets of life. With more and more businesses and services pushed online, and countries using increasingly data-driven approaches to public health issues, there is an unprecedented amount of personal data online.

Luckily, governments have recognised this as a threat. In 2019, under the EU4Digital initiative, the European Union launched a cybersecurity development project for non-EU partner states in Eastern Europe and the Caucasus. The countries involved included locations with recent or ongoing conflicts like Moldova, Ukraine, Azerbiajan, Armenia and Georgia, making them particularly vulnerable to cyberattacks.

In late 2020, Romania's capital of Bucharest was selected to host the European Cybersecurity Competence Centre, a research centre for things like encryption and network security, beating more well-known cities like Brussels, Vilnius and Luxembourg. This was an important recognition of Romania's cybersecurity capabilities. Romania is also the birthplace of one of the biggest anti-malware software companies in the world, Bitdefender, which as of 2018 recorded over 500 million customers. The software has also worked with the likes of Europol, Interpol and the FBI.

The Baltics have made some headway with cybersecurity. Estonian start-up RangeForce raised 16 million US dollars in funding in 2020, for a cybersecurity training programme. Lithuania is ranked fourth in both the National Cybersecurity Index and the Global

Cybersecurity Index, with the government running a National Cybersecurity Centre. In the Balkans, Kosovo has made some headway in cybersecurity, establishing a national cybersecurity strategy in 2020. Serbia followed suit the same year, indicating that governments are taking the issue more seriously across the board.

However, in the region as a whole, there is much work to be done in cybersecurity. According to the Cybersecurity in CEE Report of 2018, as many as 65 per cent of companies in Central and Eastern

Europe don't have a cybersecurity strategy. Companies in the surveyed regions lost an average of 1,100 euros a month to cyberattacks. Furthermore, as evidenced by the big cybersecurity attacks on North Macedonia, Bulgaria and Georgia in recent years, cyberattacks seem to be stronger than defences - or companies and state institutions are not putting enough effort and resources into cybersecurity. This makes investment in cybersecurity a top priority, for governments, businesses and people.

AI: TECHNOLOGY OF THE PRESENT AND THE FUTURE
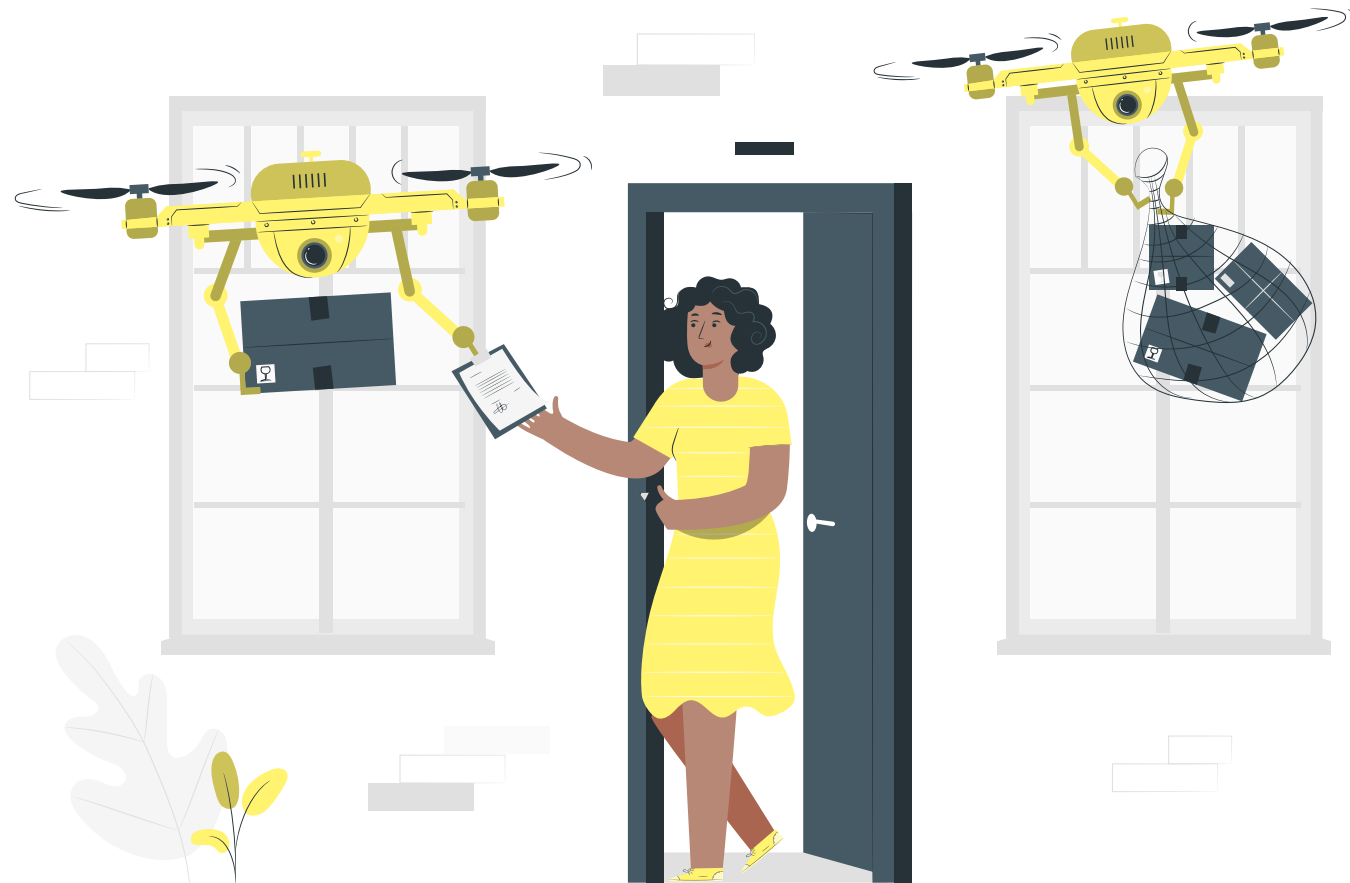
Artificial Intelligence (AI) is a new frontier in computing and is set to be a major sector in the world for the foreseeable future. AI is defined as the ability of a digital machine or computer to perform tasks normally associated with living beings; essentially simulating living intelligence, like that of people, inside a machine.

Emerging Europe has vast potential in AI. Historical factors, such as government-initiated heavy emphasis on maths and sciences in most of the countries in the region gives a solid foundation of human capital necessary for the development of AI. The fast and cheap internet in much of the region, combined with ever-increasing internet penetration rates builds on this foundation. In recent years, Poland, Belarus, Ukraine and Estonia have established themselves as hubs for AI development.

The potential applications of AI are nearly limitless. Virtually any activity done with technology can be augmented and improved with AI. AI can assist in education, law enforcement, healthcare provision and economic planning. It has vast military applications, making national militaries in the region some of the biggest researchers on the topic. The quickly-developing gaming industry in Eastern Europe has been utilising AI for years, and can continuously produce better products through continued research and development. Businesses can use AI to streamline their processes. AI even has the potential to solve enormous problems faced by the entire world, like food insecurity, demographic declines and climate change. The latter application is of particular interest to countries in Central Asia with the projected desertification of much of the region.

As mentioned previously, countries like Belarus and Ukraine have made impressive progress in AI development despite their relative underdevelopment. In 2015, Ukraine's AI development was put on the map when popular social media app Snapchat bought Ukrainian company Looksery for its 'lenses' feature in a deal worth a reported 150 million US dollars. Not to be outdone, Facebook subsequently bought Belarusian startup Msqrd, which offered a similar technology to Looksery. The following year, Google bought yet another Belarussian AI startup, AIMatter to assist with its image processing. The presence of these international tech giants in Ukraine and Belarus is a testament to the level of talent in the countries.

In 2020, another Ukrainian start-up utilising AI made waves. The English-learning app

AllRight raised 4.2 million euros for international expansion. The innovation offered by the app could also be a glimpse into an exciting future where AI improves the quality of learning - this can have huge ramifications in the education industry as a whole.

The Baltic states are predictably keeping up with the trends in AI. All three of the Baltic states are part of the Declaration of Collaboration on AI in the Nordic-Baltic Region, a multilateral initiative for AI development. The three countries also have quite sophisticated e-governance capabilities, giving AI another sector for potential innovation. In 2018, Lithuanian Railways launched a plan to integrate the management of its technologies and assets into a unified AI-powered system. In 2020, Estonian start-up Fyma, which uses AI to turn CCTV cameras into motion analytics sensors, raised 1.4 million euros in funding. In Central Europe, Slovenian translating software TAIA managed to raise 1.4 million euros in venture capital funding.

Armenia is another country whose government has made the development of AI a priority. The Digital Transformation Agenda for Armenia identified AI as a sector with vast potential applications and the Ministry of Justice has discussed applying AI to the judiciary system, reducing the work of judges and court staff. Serbia has also seen the uses of applying AI to the justice system in its 2019 Action Plan, which discussed using AI for 'predictive justice'. In Central Asia, since 2018, Kazakhstan has been using a combination of big data and AI to augment its healthcare provision system and assist in diagnostics and treatment. While the programme is still in its early stages, it shows a very important application of the technology. Despite these uses, however, few countries have devoted AI strategies.

Within its AI strategy, Hungary established the National Data Asset Agency (NAVÜ) with a goal to set the data economy in motion. It will not store data, but rather manage the strategic national data asset, encourage the use of secondary data use and ensure that public and private records enter the economic bloodstream as assets of pecuniary value. The newly established National AI Lab is commissioned to

facilitate applied research ensuring that research projects are aligned with market demand. The AI Innovation Centre is set to start to operate in the spring and its task is to help SMEs adopt AI tech in possibly large numbers. There will be also free consultancy services available for local businesses and they can test AI solutions for free as well, so that they can pick the ones that truly boost their productivity.

Beyond the general European Union AI Alliance, the majority of countries covered in this report either have already put forth specific AI strategies, or are currently in the process of doing so. The only countries in the covered region that do not have a strategy in place are Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kosovo, Moldova, Montenegro and North Macedonia. As this is a rapidly developing technology, these governments have an increasingly

pressing need to formulate their own such initiatives, lest they fall behind their peers.

AI is very much a technology of both the present and the future. According to Forrester, the Covid-19 pandemic will escalate the uses of AI. For the smooth and ethical development of the sector, national governments have to play a role in creating a clear legal, regulatory and ethical framework for companies to develop the technology in. Unfortunately, many of the countries covered in the region are yet to put forth a national policy on AI. Furthermore, some applications of AI are fraught with ethical issues - 'predictive justice' for example could be used to exacerbate class inequality through the justice system, as well as validate racial or ethnic profiling. These are all issues which have to be anticipated and dealt with for the sector to develop in a way beneficial for society.
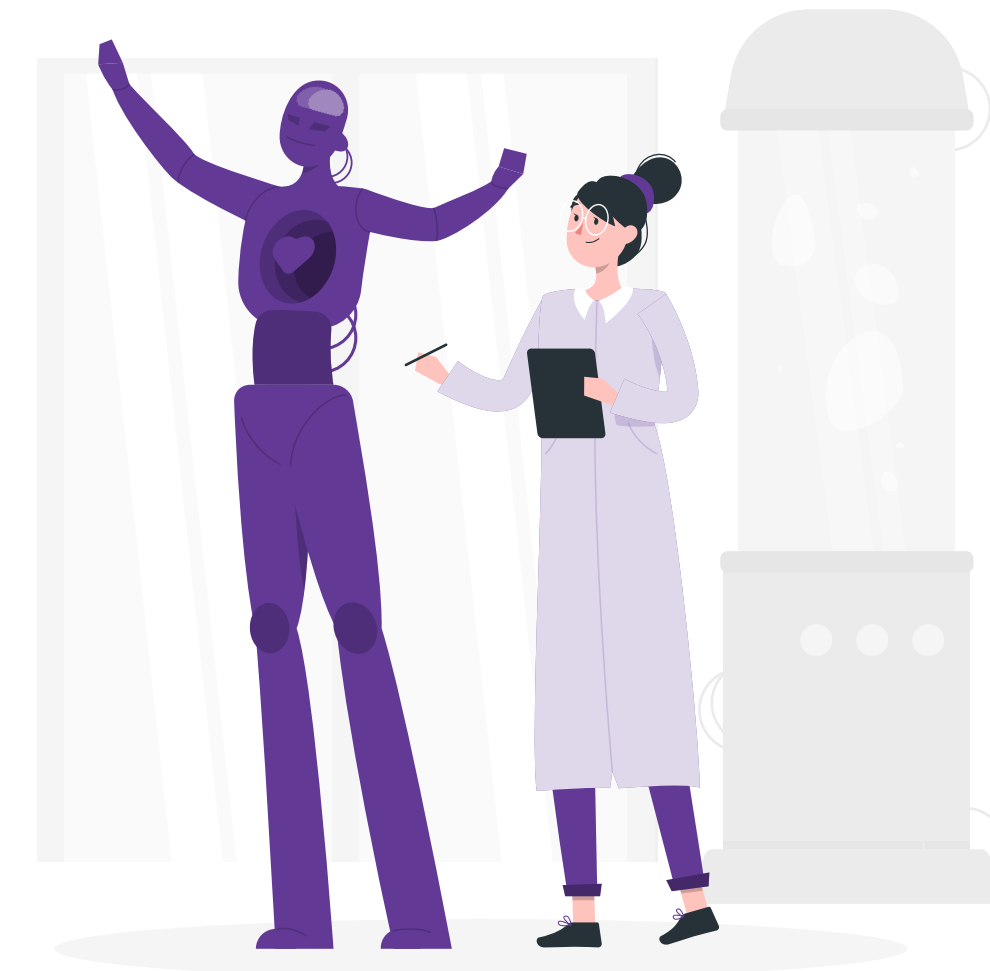
THE INTERNET OF THINGS (IOT)

The Internet of Things (IoT) is a new frontier in technology comprising a vast range of applications. IoT refers to computing devices that are connected to the internet and that can gather data and 'communicate' with other devices.
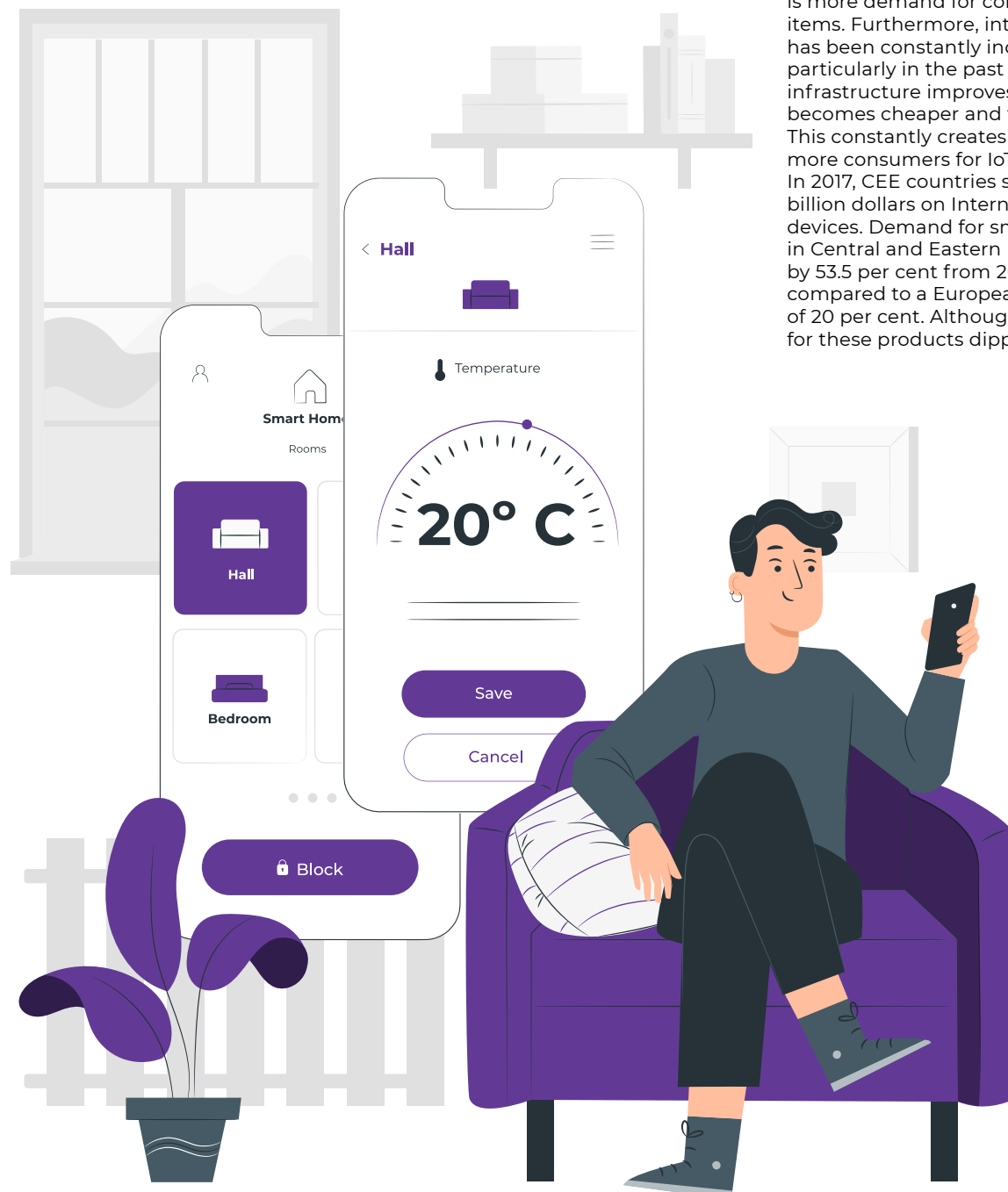
Today, IoT ranges from small devices - like smartphones, smart TVs, smart watches, earphones, fitness trackers - to more complex systems like homes, networks of cars, security systems and even entire cities. IoT is heavily linked and interrelated with big data, artificial intelligence and machine learning.

With the economic growth seen in emerging Europe over the past decades, along with the conjoint increases in salaries, there is more demand for consumer items. Furthermore, internet access has been constantly increasing, particularly in the past decade as infrastructure improves and Internet becomes cheaper and faster. This constantly creates more and more consumers for IoT devices. In 2017, CEE countries spent 9.7 billion dollars on Internet of Things devices. Demand for smart homes in Central and Eastern Europe grew by 53.5 per cent from 2018 to 2019, compared to a European average of 20 per cent. Although demand for these products dipped with the

Covid-19 pandemic, this is expected to rebound as of next year as more and more countries begin slowly opening up again.

Emerging European countries are not only a growing market for IoT devices - they can also become potential producers. Already, many western products outsource research and software development to companies in the region. For example, Ukrainian company Softengi has done IoT work for established international companies like Boeing and Zeppelin. Chinese electronics giant TLC operates a research and development centre in Kraków. In 2017, the Romanian-made Vector Watch - a smartwatch with a long battery life - was bought for 15 million dollars by US company fitbit.

There are even broader applications of IoT than simply consumer goods: some countries have put forth ambitious plans to create interconnected smart cities using this technology. This would connect various facilities and bits of infrastructure of the

city - electricity, traffic lights, central heating systems, for example - and make them all a part of an interconnected grid.

The potential benefits of this for emerging Europe are huge. The venerable infrastructure in many of these countries often leads to periods of no heating or hot water - something that can be fatal in winter. Being able to make these systems self-sustaining and self-regulating could solve such issues virtually for good, as well as make these systems more energy-efficient, cost-effective and environmentally-friendly. The relentless increase in urbanisation seen around the world makes this an ever more pressing issue.

The movement for smart cities has picked up the most momentum in the Baltic states, Estonia in particular. In 2018, the country's capital Tallinn declared intentions to become a 'smart city' - with 86 e-government services as of that year. The same year, Latvia's capital of Riga announced a similar initiative.
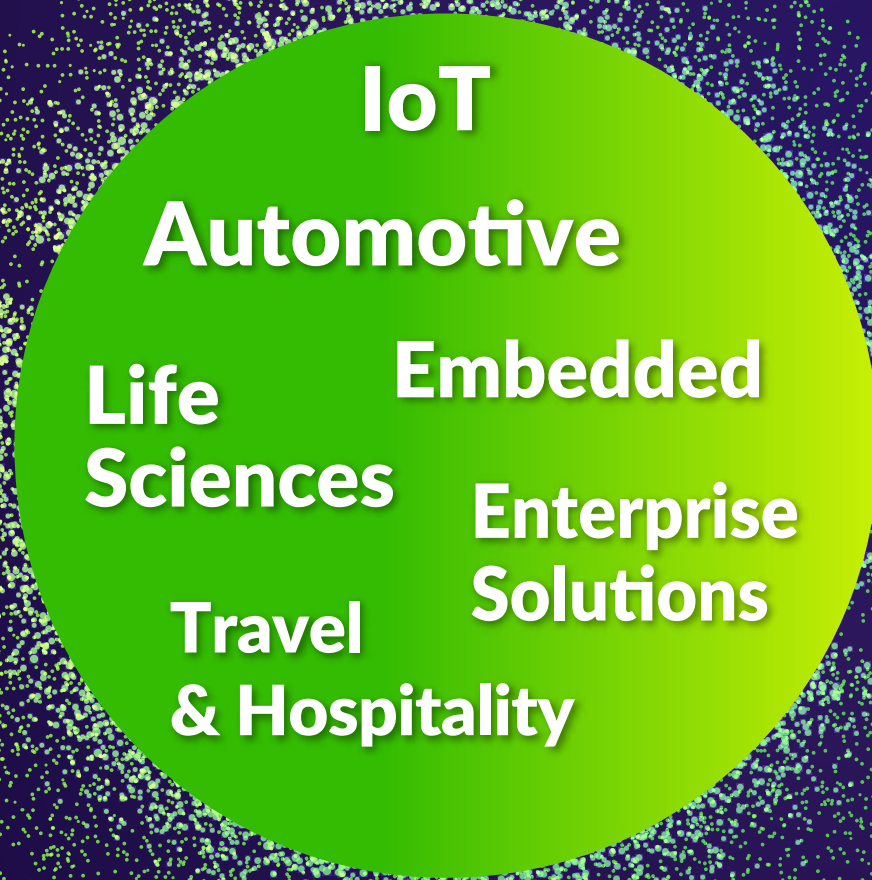
Although the potential applications, both commercial and public, for IoT devices and systems is broad, much of emerging Europe still has a long way to go before it can realise its potential. In several countries - including Georgia, Ukraine and Bosnia and Herzegovina - over a quarter of the population lacks internet access, greatly hampering any development in the field.

Ambitious projects like smart cities can only function when everybody living in them has a base level of computer and internet literacy, something which has yet to happen in virtually every country in emerging Europe, outside the Baltics.

However, demand for IoT consumer goods is nevertheless rising, despite the Covid-fuelled wobble of last year - and as the nations of emerging Europe continue developing their ICT capabilities, the benefits of this could be seen sooner than expected.

![AROBS Transilvania Software logo]

In the world of everything connected,

Let`s think together!

IoT
Automotive
Life Sciences
Embedded
Enterprise Solutions
Travel & Hospitality

Interconnectivity will be, forever, the new normal

Just like with humans, no business is an island. Any business is a part of an ecosystem formed by the employees, the customers, and partners. Therefore, any disruption has an immediate impact in a specific industry and at the same time in society as whole. We are all binded by technology, and interdependence and connectivity are all around us.

Expertise

We have extensive and consistent expertise in *software development* and engineering for Automotive, Travel & Hospitality, Life Sciences, *IoT*, and Enterprise Solutions.
Mixing software development and engineering, we create complex, safe solutions for the interconnected world of today.
We connect our expertise in IoT solutions to our embedded engineering expertise. We know how to create home automation systems and smart city solutions, as in the public lighting system project we helped develop in Finland. Our *precision farming* and *smart forestry* expertise helped to create platforms for the management and the preservation of lands and trees. For the safe travels of today and tomorrow, we can develop any projects involving smart devices engineering and risk-free travel platforms.

We will code your idea

In today's thriving environment of the IT industry, we aren't just another custom software development company. You can rest assured that our passion for technology and technological novelties, combined with sustained efforts to acquire new skills and align with market trends, turns AROBS into the most reliable custom software development company for your project.

Let`s think together!
**www.arobs.com**

[Listen to this STORY! 🔊]

BLOCKCHAIN: MORE THAN CRYPTOCURRENCY

Blockchain is still a relatively new technology that only in the past few years has started to gather momentum. Blockchain functions as a decentralised ledger of transactions which is duplicated and sent to all computers and devices on the network. This makes the history of any digital asset available for all to see, and because the blockchain is duplicated and distributed across the network, it is also virtually impossible to be altered. This can go a long way in ensuring transparency, trust and accountability. Blockchain technology has a broad range of applications, some of which can revolutionise entire industries.

For some time, the best-known blockchain application was cryptocurrency, of which Bitcoin, founded in 2009, is the most valuable.

Cryptocurrency can have far-reaching benefits for countries in emerging Europe. In fact, some of the countries in the region are far ahead of the curve in terms of cryptocurrencies than most of the world, the developed West included. In 2020, Ukraine was named as the top country in the world in cryptocurrency adoption.

Cryptocurrencies find fertile ground for growth in emerging Europe for several reasons. After the widespread collapse of communism in the 1980s and 1990s, much of the region had severely underdeveloped banking infrastructure, pushing people to look for alternatives. The economic crises of the 1990s also lead people to have a low sense of trust in traditional banks, at least lower than in the West. Furthermore, countries like Ukraine still lack developed formal stock exchanges, so people looking for appreciable assets to invest in put their stock into cryptocurrency instead. In 2020, the nations of Russia, Ukraine, Belarus and Moldova accounted for 12 per cent of cryptocurrency transactions
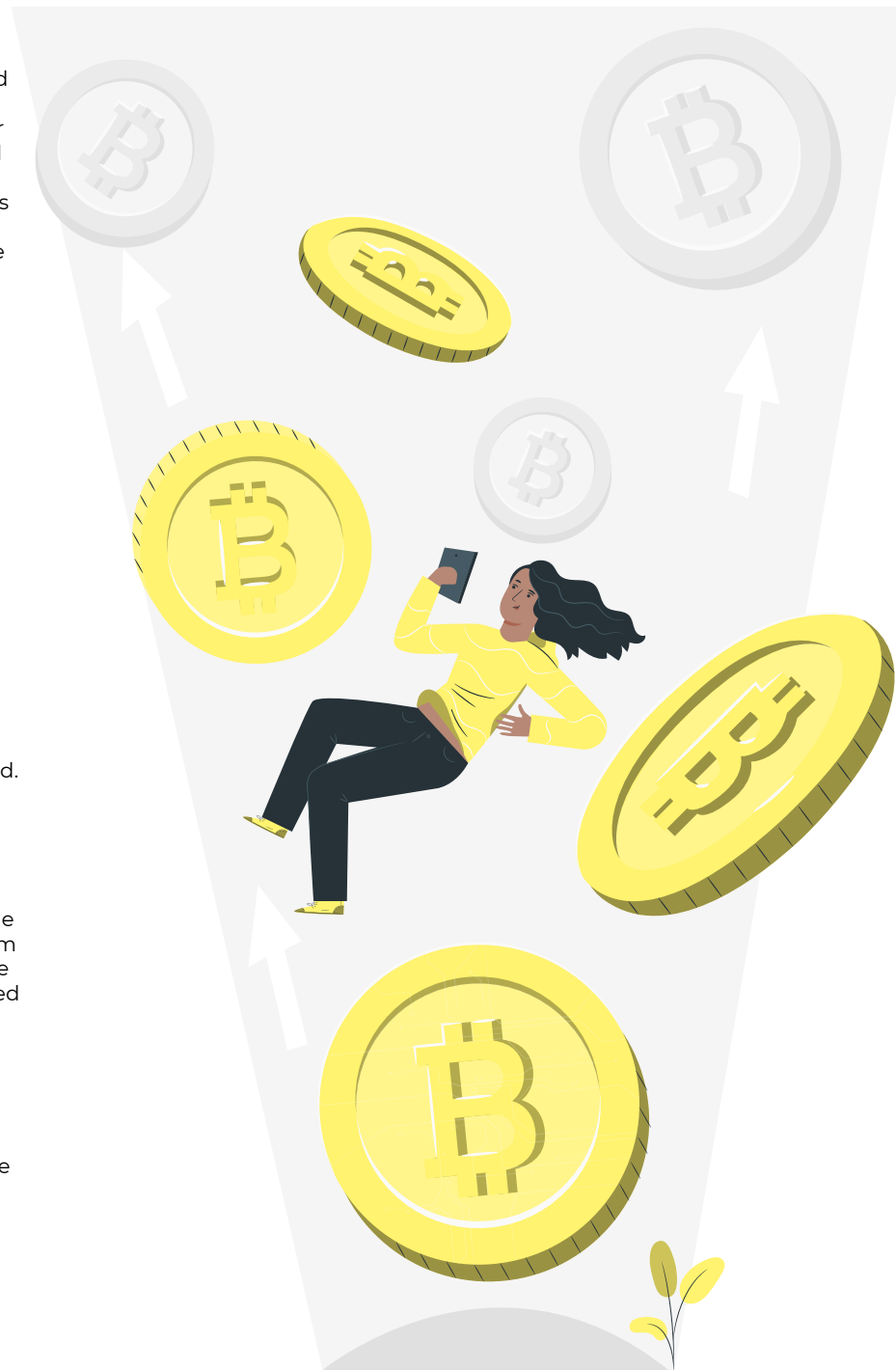
worldwide. This popularity of cryptocurrency in the region has given a solid foundation for blockchain technology to grow in emerging European countries.

Start-ups have begun popping up to service this demand for cryptocurrency trading, all using blockchain technology. In 2020, Slovakian start-up altFINS raised one million euros in seed funding, for its app which allows people to aggregate data relating to the cryptocurrency market. This year, Slovenian start-up Eligma raised four million euros in funding, for its product GoCrypto, a platform which allows sellers to receive payment in cryptocurrencies. Ukraine has already began drafting laws regulating the use of cryptocurrencies. In 2019, the Bank of Lithuania unveiled its own digital coin, targeted at collectors. This follows some global precedents, like China's ambitious plan to have a state-sanctioned digital currency which can possibly even challenge the US dollar's international eminence.

To reduce the application of blockchain technology just to cryptocurrency would be doing the technology a disservice, however. Blockchain technology can be used for electronic contracts for example, a rapidly growing service. In countries like the Baltic States which have sophisticated e-government capabilities, this is particularly important and relevant - many of the e-government services provided are registered using blockchain technology. Blockchain can also go a long way in improving transparency and trust - the nature of the technology, being a public ledger that virtually anyone can access is vital in ensuring this.

In Georgia, the government uses blockchain technology for the country's national public registry. Land claims are stored digitally, and thus have the ability to be independently verified. This is an innovative use of blockchain technology with particular utility for countries in emerging Europe, where much of the time, laws are flouted in the business world. Take the phenomenon of 'raiding' in much of the post-Soviet world as an example - local businessmen would send thugs to forcibly claim a rival's property and present forged documents about transfers

of ownership. Such practices could be virtually eliminated, creating a viable environment for businesses to flourish. In recognition of the benefits of this technology, in 2019, Slovenia became the first country in the European Union (and only the second worldwide, after China) to establish national blockchain testing infrastructure, known as SI-Chain.

Blockchain technology also has utility for the private sector. Businesses can benefit from being able to demonstrate proof of their reliability and trustworthiness through the blockchain ledger. Items can be tracked from their point of origin to where they arrive, thus making it more difficult for counterfeits to slip through the cracks. Emerging Europe is full of start-ups and companies which service this demand - companies like Poland's 10Clouds and Bulgaria's Limechain have partnerships with prominent international companies in developing software using blockchain technology. In 2019 Ukrainian start-up UATAG came up with a particularly innovative and inexpensive way of combatting counterfeiting – it uses a photo of a piece of shattered glass to tag elements in the blockchain. Serbia

has also begun to develop a strong blockchain sector, which looks set to be given a boost when the government proposed a Law on Digital Assets in 2020. In 2019 and 2020, Serbia placed fifth worldwide in sheer number of blockchain developers. Serbian blockchain company MobileGo reached a valuation of 56 million US dollars in 2020.

Despite the potential uses, countries have been slow to pass policies or initiatives related to blockchain technology. To this day, Slovenia and China remain the only countries with specific national blockchain testing sandboxes. Although Ukraine's government has made moves to regulate cryptocurrencies which have heavily proliferated in the past decade, the law is yet to have been passed. Furthermore, blockchain technology also has a dark side - cryptocurrencies are used to trade illegal items, including drugs, weapons and forged documents. However recent trends - like the European Union's call to create a unified regulatory regime for blockchain technology - shows that we are moving in the right direction.

EMBRACING
THE CLOUD

With the world becoming increasingly digitised, cloud computing has been rising in ubiquitousness. Cloud computing refers to a method of delivering computing resources - whether it be data centres, server space or software - through the internet, or the 'cloud'. The exponential increase in data use that has occurred in conjunction with society's digital transformation makes it increasingly expensive for businesses to maintain all their vital files, data and systems on in-house servers. This has opened the door for companies specialising in cloud computing to do this background work on behalf of the companies. As always, emerging Europe benefits from this through outsourcing, with many international firms contracting companies from the region for cloud computing.

There are numerous benefits to cloud computing for businesses. It can greatly reduce maintenance costs - instead of companies having to maintain their own systems, a cost which increases with the size of the operation, they can contract others to do this for them at a flat rate. As cloud computing companies are also responsible for maintaining adequate security around their software, the contracting firms can also save resources on cybersecurity. Storing vital files, data and information on the cloud can also save businesses from potentially catastrophic accidents.

Furthermore, cloud computing allows companies to access software on demand, instead of having to stockpile software which they may or may not end up using. Cloud computing also has public benefits. With the increasing move towards integrated 'smart cities' and e-governance, particularly in

the smaller countries of emerging Europe, there is an increase in demand for storage space for all the data required to make such sweeping projects function. In 2018, software cloud services (SaaS) dominated Eastern Europe's cloud computing market, taking up 62 per cent.

The Covid-19 pandemic has also driven demand for cloud services. Companies all over the world were driven into the virtual space as countries instituted full lockdowns. Coordinating business processes entirely online, without a physical shared workspace requires vast storage space, something which

can only be done cost-effectively through cloud computing. This has led to a worldwide spike in demand for cloud services.

Poland is one of the leaders in emerging Europe in cloud computing. In 2018, a joint initiative by the Poland's PKO Bank and the Polish Development Fund was announced, in which a 'National Cloud' would be established. This makes it significantly cheaper for Polish enterprises to subscribe to, and goes a long way in supporting and bolstering the digitisation of society. In 2019, Google signed a strategic agreement with Poland's National Cloud, with Google getting access to Poland's cloud

services as a result. Microsoft followed suit a year later, along with a promised investment of one billion dollars and the opening of a data centre. In 2020, American cloud computing heavyweight Box opened a research and development site in Warsaw, an endorsement of the country's sophistication in the technology.

Elsewhere in Emerging Europe, Azerbaijan also has a government-run cloud service, known as AzCloud. Estonia, Lithuania, Latvia and Kazakhstan all have similar systems. The latter country in particular has seen the utility of this - cloud can make government functions and communications

much more efficient in the vast country. Romanian cloud computing company Star Storage has made waves around the world, enjoying a 10-year working relationship with Japanese electronics conglomerate Hitachi.

Despite the clear benefits of cloud, in much of emerging Europe, both companies and governments have been slow to adopt this. This holds true even following the covid-19 pandemic which saw worldwide increases in demand for cloud computing services. In Serbia, for example, half of surveyed companies reported not using advanced cloud computing,

compared to just 18 per cent of worldwide ICT companies. More government initiatives like that of Poland - constructing a national cloud which local companies and international conglomerates alike can subscribe to - so far seems to be an effective method of speeding up the digitalisation of the economy and of society.
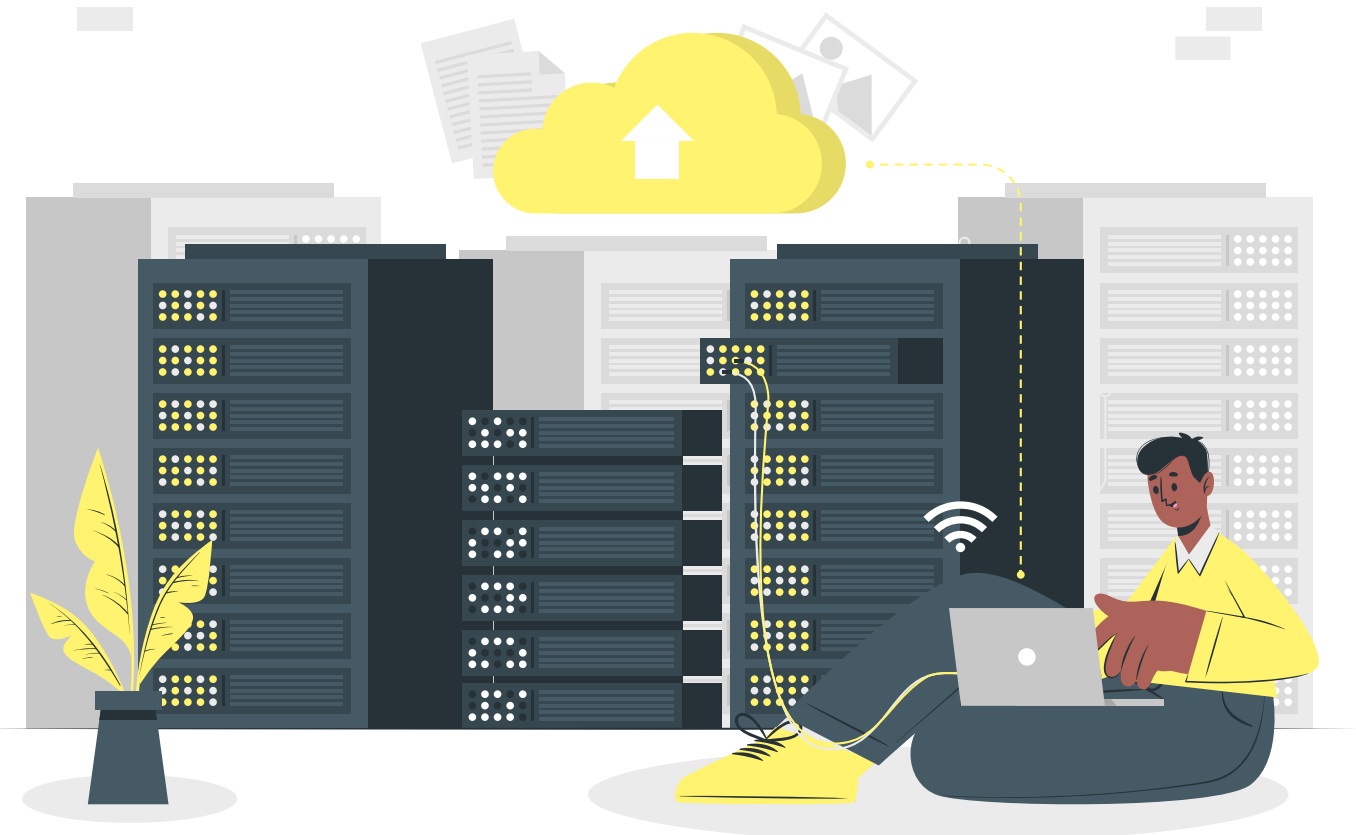
A BRIGHT FUTURE BECKONS FOR VR AND AR

For years, virtual and augmented reality (VR and AR) have been the most talked about and the hottest sector within the ICT sphere. It's easy to understand why — the potential applications of VR/AR seem virtually limitless. From entertainment in the form of immersive video games to helping surgeons and engineers access information faster and in more convenient ways.

While there is no clear leader in CEE when it comes to virtual reality, many countries in the region are competing in the sector, with start-ups leveraging the technology to many different ends. Poland leads the way with the number of software developers working in the space, but notable examples of VR tech are found in most CEE nations.

According to the statistics portal Statista, the VR and AR market is expected to reach a value of nearly 60 billion euros by 2024. This means there is still a lot to play for in the space. While there are strong contenders in the consumer market in the form of Facebook's Oculus, Sony's PlayStation VR, and HTC's Vive, no single leading standard in the space has emerged, leaving the door still open to start-ups from around the world.

In Estonia, one of the key players is a start-up called Wolfprint 3D, which is working on making avatars for use in the virtual spaces more realistic. The company is able to create these from a single selfie image. Clients include Tencent, Huawei, HTC, Vodafone, and Wargaming. Estonia is also home to the R&D centre of Criffin, a London-based company developing VR for industrial and military applications.

Poland is a significant presence in the region when it comes to the VR and AR industry. Where the country really excels is in the number of software developers for the VR platforms. A search on Clutch.io reveals more than 50 active companies around the country.

Some notable examples include The Farm 51, a game developer which has also produced its own proprietary VR engine that is compatible with the major players in the consumer market. In addition, the company has also developed training simulations for military use. Companies in Poland also produce business VR solutions such as the Gdynia-based VR Visio, and Krakow-based EPIC VR which makes content for companies in Poland and Europe.

Given the country's strong video game industry, it is not surprising that many gamedevs are also exploring the VR/AR space.

In Czechia, the carmaker Škoda has used AR solutions to help with logistics and workplace safety. Lifelique, a California-based company with an office in Prague is making edtech solutions to enhance STEM curricula with AR and VR. The positioning of the CEE region as an outsource and R&D hub is clear in the VR space, just like in the broader ICT sector.

In neighbouring Slovakia, the 3D augmented reality platform Vectary recently secured nearly six million euros in VC funding. Through the platform, users can produce 3D, VR, and AR content without the need for in-dept modelling expertise.

Another ed-tech play, this time from Serbia, comes in the form of Propter, a company which has received 97,900 US dollars from UNICEF's Innovation Fund — the first company from the country to do so. Their ScioXR platform is actually open source, and it lets students visualise complex physics problems and chemical reactions in an easy-to-understand way using VR and AR.

The Budapest-based AerinX is helping in the aerospace sector with a tool that uses augmented reality to make aircraft inspections easier. It has recently completed a Series A funding round to the tune of two million euros.

On the whole, it is still early days for VR and AR in the CEE region. A number of start-ups are active in the space and have gotten attention from venture capital funds both domestic and foreign. Most of the start-ups are focused on the software development side, rather than on hardware solutions. Just like in most ICT sectors, the pieces are there to make CEE a regional hub in VR.

A possible way to promote virtual and augmented reality comes from Estonia, where the government spent around one million euros to create a VR-based showroom of the country's digital accomplishments, that includes a 360 degree video virtual sit down with the country's president Kersti Kaljulaid.

From video games to the aerospace industry, innovative start-ups in the region are making extended reality products that are attracting international attention, a clear sign that there is potential for development and growth in the sector for CEE.

5G Making the Internet of Things possible

5G is the fifth generation technology standard of broadband cellular networks. It utilises shorter, higher-frequency bands and is defined by lower latency, higher speeds and greater bandwidth capacity. This gives it an enormous range of applications, particularly with the continuous growth of Internet of Things (IoT) products and AI-capable devices. 5G is hitting the market fast - South Korea was the first country to fully adopt it in April 2019. Since then, in under two years, another 37 countries have 5G networks up and running, with many more having preliminary infrastructure already deployed.

5G can have huge benefits for the countries of emerging Europe. The increased bandwidth, and thus capacity of the network can allow more devices than ever to be supported at once. This is particularly pertinent to IoT products - now more and more devices can be integrated. With the recent move towards 'smart cities' and electronic governance, this can be a vital boost. The numbers are particularly promising in this: 5G is estimated to be able to support up to one million devices in a one square kilometre radius. In contrast, 4G, the previous generation of cellular networks, could only support 2,000 devices in the same area.

In addition to this, the much faster speed of 5G networks can have major impacts on businesses. 4G topped out at a maximum speed of around 100 megabytes per second, under perfect conditions. In contrast, 5G has a potential maximum speed of 10 gigabytes per second - literally 100 times faster than its predecessor. With the vast amounts of data that enterprises process constantly growing, this can be a decisive factor in allowing business' capacity to increase.

Another enormous benefit of 5G - particularly for the developing countries of emerging Europe - is how 5G infrastructure is more affordable than its predecessors, with a much bigger payoff.

Furthermore, the European Investment Bank estimated that 5G technology could reduce energy consumption by between 50 and 95 per cent. This is an especially big benefit for energy-dependent countries and could break the stranglehold some major energy producers have over much of Europe.

Currently, in emerging Europe, only Moldova, Kosovo and Kyrgyzstan don't have any form of 5G infrastructure. Other countries, like Ukraine, Belarus and Serbia have pushed back plans for widespread 5G adoption following the Covid-19 pandemic and the

subsequent shift to other priorities.

5G has also been another facet of the long-running trade war between the United States and China. With the former concerned about the latter's surge in influence - including in areas which historically have been firmly within the US's zone of influence, like Europe - many countries of emerging Europe have been caught in the crossfire. In 2019, the United States banned its own companies from buying any hardware from Chinese telecommunications giant Huawei. Some countries within emerging Europe, like Czechia also expressed their concerns about Chinese-

made 5G networks being used by the Chinese government to spy on European countries.

This puts much of emerging Europe in a difficult position. China's Huawei is already a world leader in 5G technology - and offers much cheaper installation rates than its European competitors, like Orange or Telia. With much of emerging Europe being allies of the United States, governments are reluctant to anger their powerful patron. Huawei has even been banned from some western European countries, including the United Kingdom. However, this tense standoff can be an advantage for countries which

are not as beholden to the United States' whims, as Huawei is forced to look for alternative clients and offer even cheaper rates.

As of today, Romania, Poland, Latvia, Estonia and the Czechia have all signed memoranda of understanding with the United States regarding 5G security. Although none of these specifically mention Huawei, many find it obvious that this is the United States' main target. If the US continues putting pressure on its allies in emerging Europe, this could have detrimental effects on the adoption of 5G.

5G has also been the subject of numerous disinformation

campaigns, conspiracy theories and unsubstantiated allegations. Some go so far as to blame 5G towers for the Covid-19 pandemic. Although these sound ludicrous, their proliferation could also harm the spread of 5G.

Despite these challenges, the benefits of 5G are so clear that it appears to be only a matter of time before it becomes universally adopted. Some estimate that by 2025, there will be 1.7 billion 5G users in the world. If true, this could spur massive evolutions of our current technological capabilities.

256 Mbps

AUTOMATION IN EMERGING EUROPE NEEDS TO OVERCOME PUBLIC CONCERNS
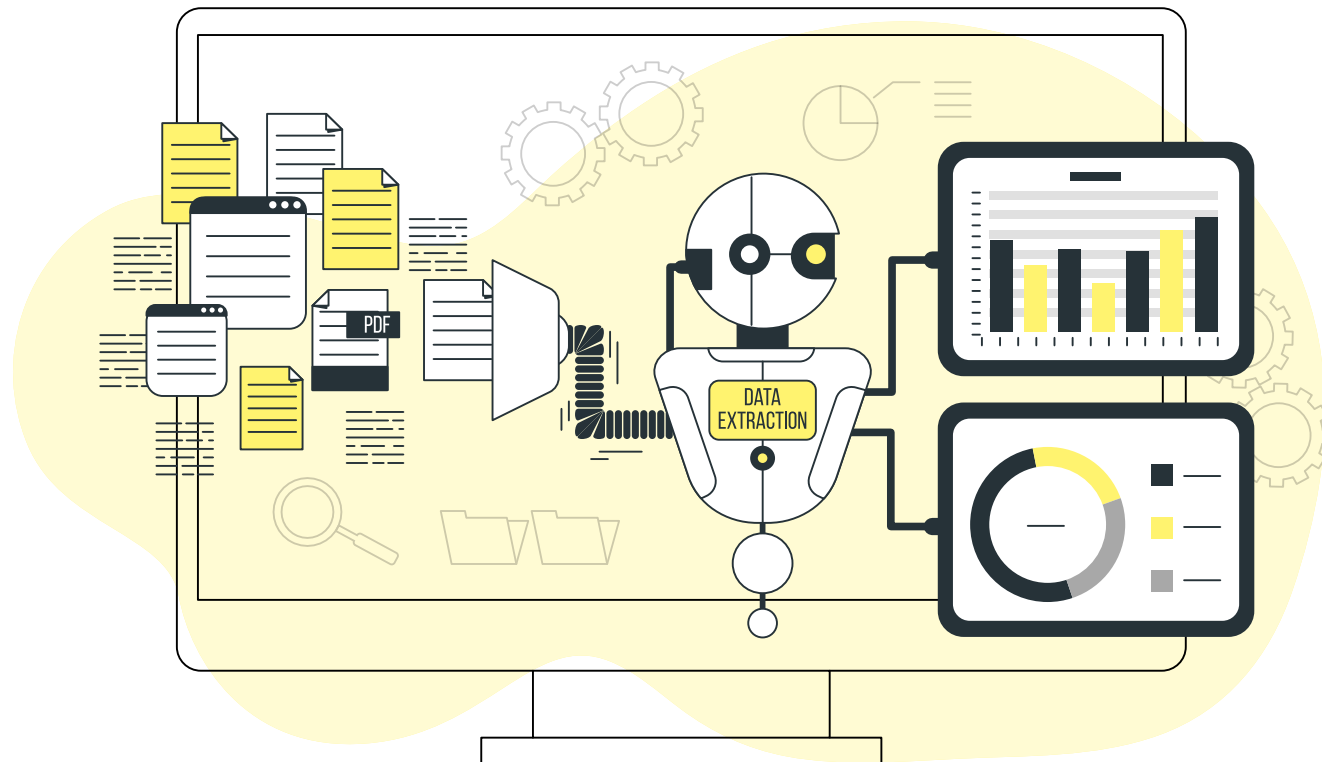
Robotic Process Automation (RPA) continues to be a major driving force in outsourcing solutions, but today's challenges are more granular. According to Deloitte's 2020 Global Outsourcing Survey, over 75 per cent of respondents are actively considering or already pursuing RPA in their sourcing arrangements and that trend is growing: there is a clear progression in the adoption of RPA through outsourcing.

RPA is among the fastest-growing industries worldwide due to the solution it provides to some of the major problems faced by large businesses. Process automation via software eliminates the need for some frequently repetitive tasks to be handled manually, thus allowing employees to focus on activities that have higher value and importance. Previously, Gartner reported that by the end of 2020 around 40 per

cent of large businesses would have integrated RPA software which will be optimising the workflow within the company. In some industries the percentage of companies that have already implemented RPA is even higher.

In emerging Europe, spending on robotics and related services are expected to have exceeded 4.2 billion US dollars in 2020. But while companies are increasing their usage of robots, public attitudes remain negative.

According to a 2017 Eurobarometer poll, the majority of respondents were concerned about the impact of robots and artificial intelligence on employment: 74 per cent expect more jobs to be lost to robots and artificial intelligence than will be created; 72 per cent believe robots steal peoples' jobs; and 44 per cent of those who are currently working thought their

current job could at least partly be done by a robot or artificial intelligence. In Hungary, 38 per cent of the population is against automation, one of the highest percentages in Europe.

The countries of emerging Europe have much to gain from automation. Low fertility rates and demographic decline plague much of the region. The Visegard Four — the nations of Poland, Hungary, Czechia and Slovakia — are projected to see a decline of eight million people by 2050 at the current rate, over ten per cent of the current combined population. Ukraine's population meanwhile has declined by nearly a fifth since 2000.

The consistent economic growth seen in the region in the past few decades exacerbates the issue caused by demographic decline - now salaries are higher than ever in much of the region

and unemployment rates are low. In conjunction with the small and shrinking labour force, these factors make it more difficult for companies to hire new employees. Automation is an effective response to these issues, especially in countries which have been reluctant to turn to immigration to curb their labour force decline.

Workers in emerging Europe can also benefit from automation. Robots and machines can perform the most monotonous, repetitive and hazardous tasks, freeing up humans to do less physically taxing labour. Furthermore, robots don't necessarily have to replace human labour. They can also be used to make certain jobs much easier for individual workers. However, automation could also slow down the outsourcing industry, which emerging Europe has benefited so much from - western firms could choose to keep production within their own borders as with widespread automation, the high costs of labour would be less of an issue.

Automation can also drive countries' GDP growth by simultaneously raising productivity levels and addressing the labour shortage. Czech hospital bed producer Linet was founded in 1989, after the end of the communist regime. Today, Linet is one of the

world's biggest hospital bed makers, with 900 employees making 500 beds a day. Its devices monitor and collect data on patient health, and can cost as much as a BMW. Despite these huge numbers, Linet has not been able to employ enough people, with the unemployment rate in Czechia the lowest in the European Union.

In emerging Europe, Slovakia and Slovenia lead innovation in robotics and automation as of 2019. Slovakia had 151 robots per 10,000 workers while Slovenia recorded 144; this is far above the European Union average of 106. In Czechia, new robot installations rose by 40 per cent between 2010 and 2015, highlighting the utility of automation in combating labour shortages.

In Poland, 30 per cent of companies in the manufacturing sector plan to introduce robots into their operations in the next three years; between 2017 and 2018 the number of robot installations rose by 40 per cent as well. In 2020, Polish robotics start-up VersaBox received 2.5 million euros in funding for international expansion.

Romania is where the unicorn software company UiPath was founded. UiPath is a major player in robotics and automation, focusing on software automation for big companies. It has a valuation of over 35 billion US dollars. Since 2020,

UiPath has been actively searching for start-ups specialising in B2B software automation, offering a 50,000 US dollars cash prize and access to its expertise and network of clients.

In Armenia, the government has announced an ambitious plan aiming to equip 50 per cent of schools in the country with robotics labs. This is recognition of the belief that automation can help countries counteract small labour forces and low natural resources. Armenian company Expper Tech won a grant from an EU initiative for designing a business assistant robot. Azerbaijan has maintained a national robotics lab since 2018 alongside a Robotics and Automation Society.

However, automation comes with its pitfalls. Large swathes of the population in the covered region view it with suspicion, having little faith that it won't lead to them losing their jobs. And this is a valid fear, especially with the shocks of the 1990s which saw many of the old working comforts of the region suddenly ripped away. Conventional wisdom states that the jobs lost in manual fields will be replaced by jobs in other sectors, but there is no guarantee.

Although automation will lead to an increase in jobs in the ICT fields, not every worker who loses their job to automation will necessarily learn how to code. In countries where businesses are less regulated by the government, this could increase stratification within the labour force, where there will exist an aristocratic minority of ICT workers, with ever-increasing numbers of people sucked into the 'innovative' yet precarious gig economy.

To ensure that automation is used for the benefit of society and humanity as a whole - and not a way for business owners to reduce costs and increase profits, governments have to take an active role in mitigating the externalities. This includes retraining programmes for workers and stronger safety nets to support the temporarily unemployed.

However, automation has the potential to vastly change society by making products more accessible for regular people and working conditions safer and less stressful. If harnessed the correct way, automation can be a major factor in making our lives easier.

EMERGING EUROPE   Clutch
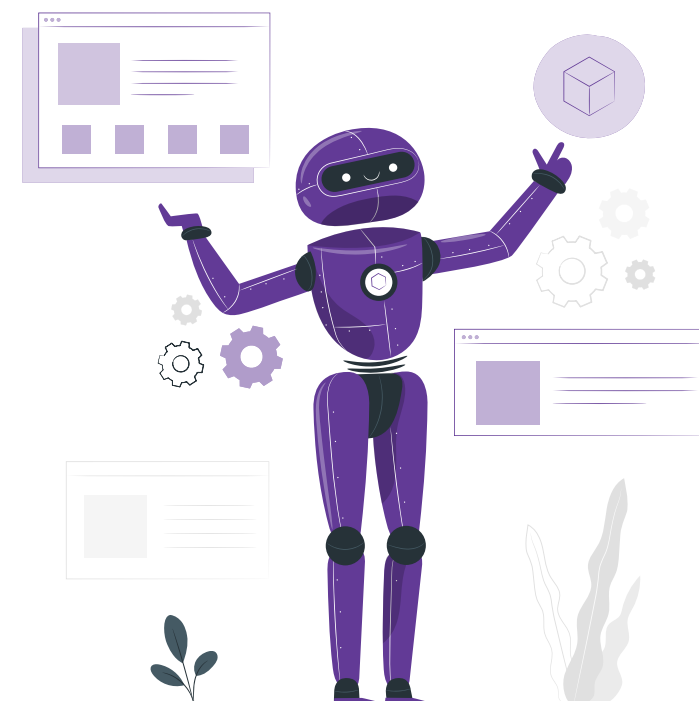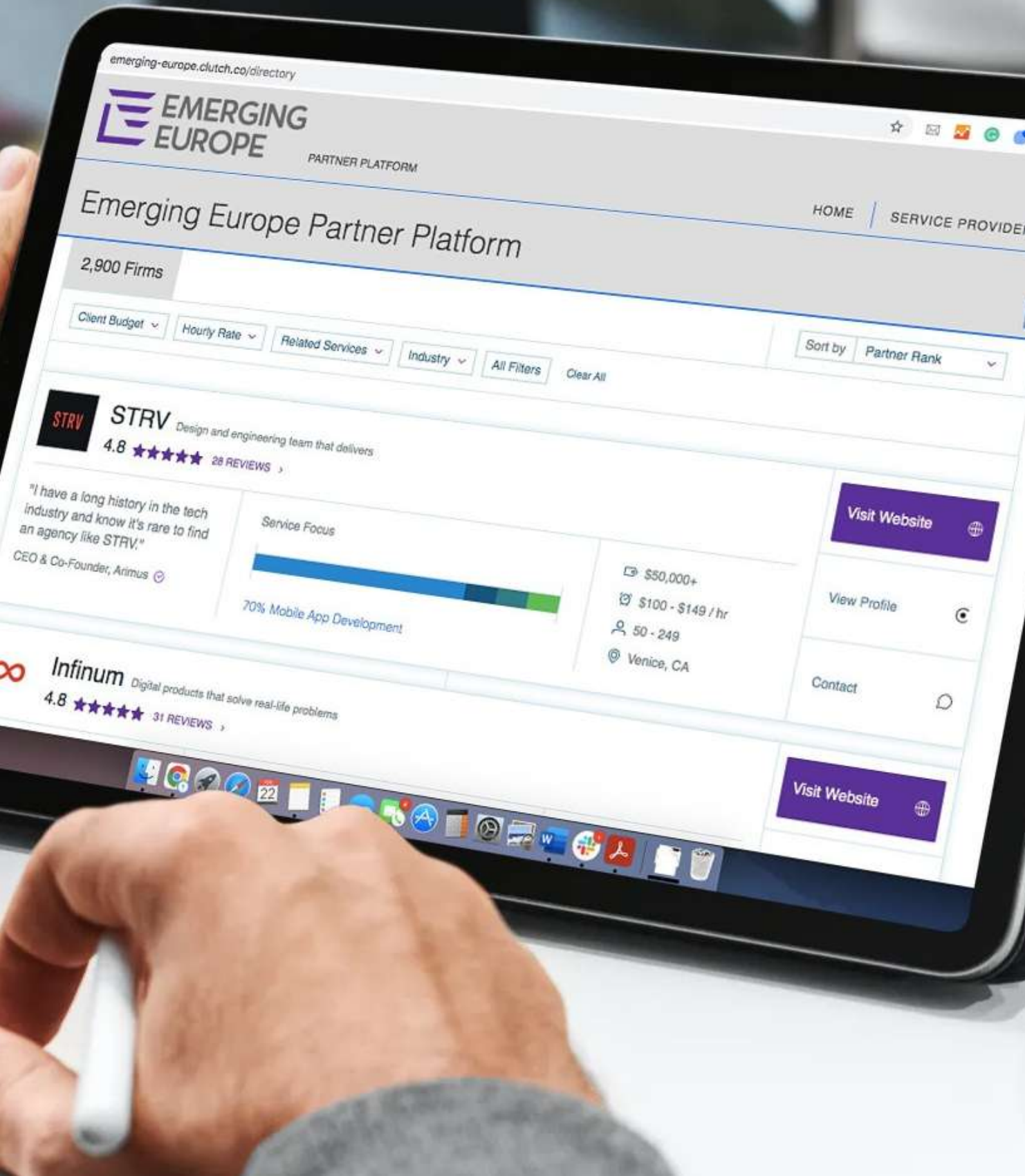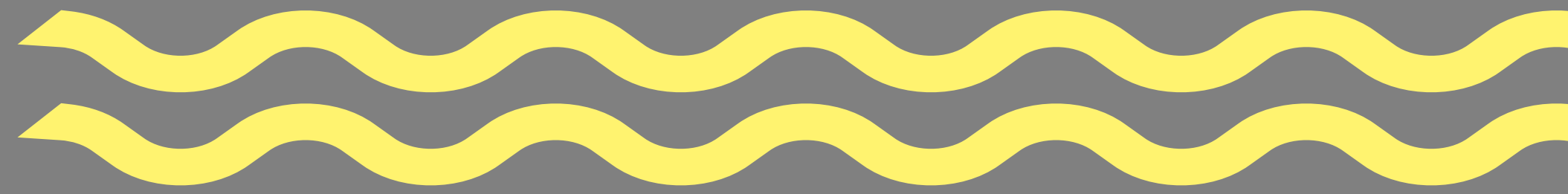
PARTNER DIRECTORY

List your firm
alongside 3,000+
quality IT providers
from emerging Europe.

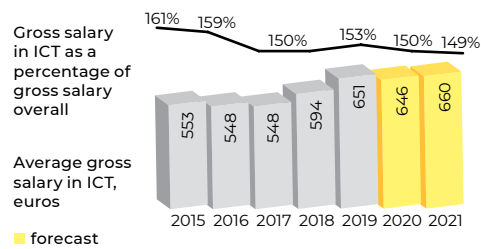emerging-europe.clutch.co/directory
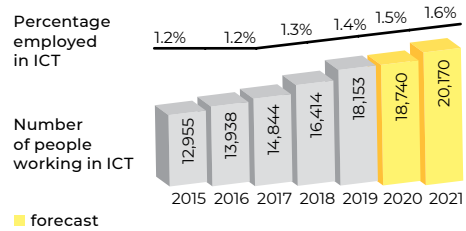
COUNTRY PROFILES

ALBANIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
2.846	1,430,374	13,644	4,794	247%	1,144

Albania's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
82	57	54	48	69	43

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

161% 159% 150% 153% 150% 149%

Average gross salary in ICT, euros

553 548 548 594 651 646 660

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

1.2% 1.2% 1.3% 1.4% 1.5% 1.6%

Number of people working in ICT

12,955 13,938 14,844 16,414 18,153 18,740 20,170

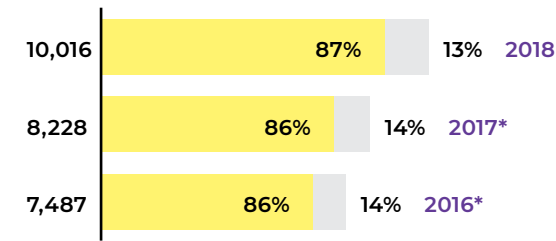2015 2016 2017 2018 2019 2020 2021

■ forecast

Albania is a country with huge potential for growth in the ICT industry. Although it has a relatively small population, Albania has a large diaspora, offering its people access to the benefits of more developed countries. With an average age a full decade lower than the European Union, and relatively high levels of university enrollment, Albania has the human capital to develop its ICT industry. Business-friendly policies implemented since the fall of communism have allowed the business environment to improve and the ICT sector has come to represent a major source of foreign income for the Albanian economy.

With lower average salaries and costs of living than the European average, Albania has become an attractive place for outsourcing. There are currently **3,089 active enterprises** that operate in the ICT sector in Albania, out of which 752 were registered in 2019. 488 operate in telecommunication, 1,371 in computer programming and consultancy and 539 in information service. The number of active foreign companies in 2019 amounted to 279.
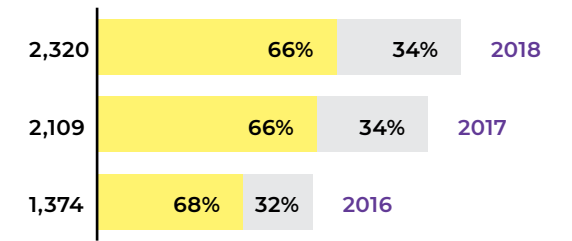
The most successful and well-known Albanian start-up meanwhile is the Albanian language search engine Gjirafa — a particularly needed software because of the uniqueness of the Albanian language. Other prominent start-ups include food delivery service Baboon and service industry tool SoftMogul.

The government has recognised the potential of the ICT industry, and in its initiative *Digital Agenda for Albania 2015-2020*, it identified developing the sector as a key priority. Now, ICT companies enjoy the lowest corporate tax rates of all businesses in the country.

Two seed accelerator programmes, Protik and Oficina operate in the country, with the former also involved in teaching children coding. However, both report struggles for funding. Other programmes and institutions like Garazh and Yunus Social Business share knowledge, expertise and resources to up and coming ICT businesses.

The statistics show a general improvement in most indicators for Albania's ICT industry. Although exports of ICT services dropped, exports of computer services rose from 5.5 million euros in 2016 to over **47 million euros** in 2019. Only 18,000 people are employed in the ICT sector, which represents 1.43 per cent of the total number of people employed in the economy, one of the lowest in the region.
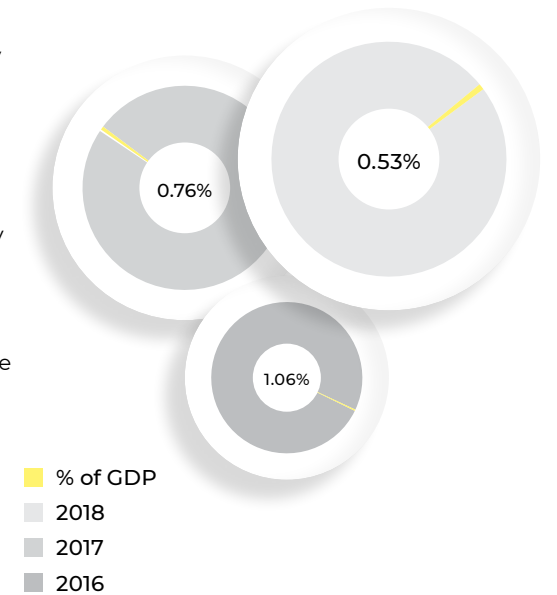
Salaries however have been steadily increasing. Despite this, Albania suffers from severe brain drain and its internet penetration rate, standing at just under 70 per cent, is lower than Europe's average. These however are relatively minor issues and Albania has undoubtedly created a strong foundation for the ICT industry to continue to develop.

In the IT Competitive Index Albania **ranks 17th** among the 23 countries of emerging Europe. There are 638 ICT specialists per 100,000 people, which accounts for about 70 per cent of the Western Balkans average and about 60 per cent of the emerging Europe average.
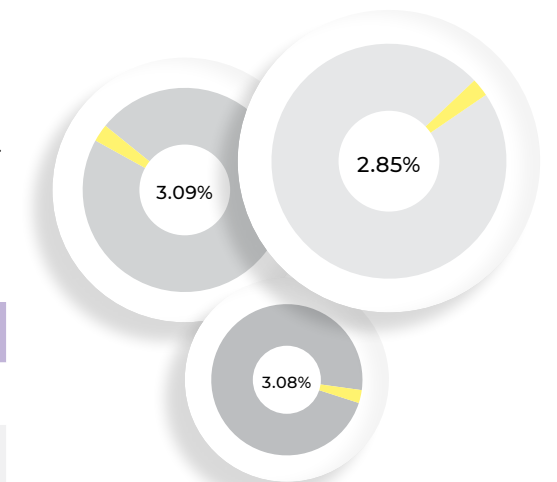
The country scores relatively low in the International Mathematic Olympiad (77th in 2020). On a positive note, the country is on a path towards producing more IT specialists in the future — only Serbia has a higher number of IT students per capita than Albania across the Western Balkans.

Albania has the **highest number of IT graduates** per 100,000 (81) across the emerging Europe region.
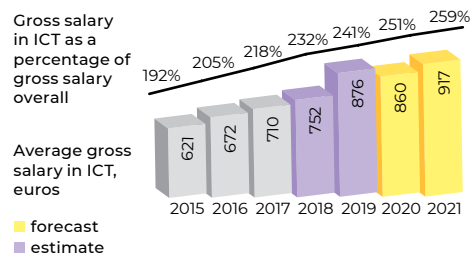
ICT STUDENTS

10,016	87%	13%	2018
8,228	86%	14%	2017*
7,487	86%	14%	2016*

■ bachelor and short-term
■ master's and doctoral
* estimate

ICT GRADUATES

2,320	66%	34%	2018
2,109	66%	34%	2017
1,374	68%	32%	2016

■ bachelor and short-term
■ master's and doctoral

ICT EXPORTS

0.76%　0.53%　1.06%

■ % of GDP
■ 2018
■ 2017
■ 2016

ICT VALUE ADDED

3.09%　2.85%　3.08%

EXPORTS

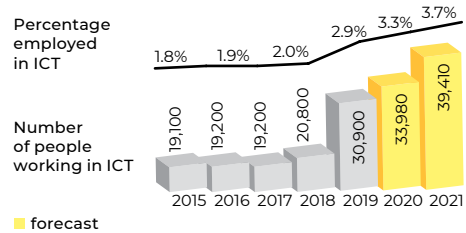|	2015	2016	2017	2018	2019
ICT services (millions, euros)	101.1	113.3	87.6	68.3	96.5
of which **computer services** (millions, euros)	10.0	5.5	20.4	37.4	47.4

ARMENIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
2.960	1,318,100	12,210	4,125	417%	227

Armenia's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
47	34	50	-	81	51

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

192% 205% 218% 232% 241% 251% 259%

Average gross salary in ICT, euros

621 672 710 752 876 860 817

2015 2016 2017 2018 2019 2020 2021

- forecast
- estimate

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

1.8% 1.9% 2.0% 2.9% 3.3% 3.7%

Number of people working in ICT

19,100 19,200 19,200 20,800 30,900 33,980 39,410

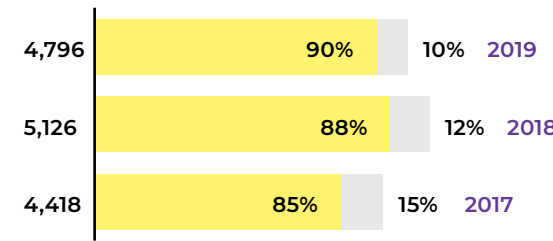2015 2016 2017 2018 2019 2020 2021

- forecast

Armenia can be considered the tech powerhouse of the Caucasus, thanks to several unique historical factors. Under Soviet rule, Armenia was the USSR's hub for technological research and the centre of high-tech manufacturing, with 15 universities built during the period, providing a foundation for such industries to flourish.

Upon independence, Armenia found itself in a predicament: it was a small country, lacking natural resources, cut off geographically from natural allies and hemmed in on two sides by hostile governments. As such, in 2000 the Armenian government declared the development of the **ICT industry a top priority**, identifying the Armenian people themselves as the country's biggest resource.

Armenia is also one of the few countries in the world whose diaspora dwarfs its home population - some estimates put the Armenian diaspora at 11 million, nearly four times Armenia's population. With this diaspora known for retaining strong cultural and emotional ties with the home country, it has in recent years become a source of financing, talent and creativity for the Armenian ICT industry. Take the TUMO Centre as an example of this impact, founded in 2011 by a US-based Armenian couple, it is a remarkable centre of learning where **children aged 12-18 learn coding**, programming and design, all for free.
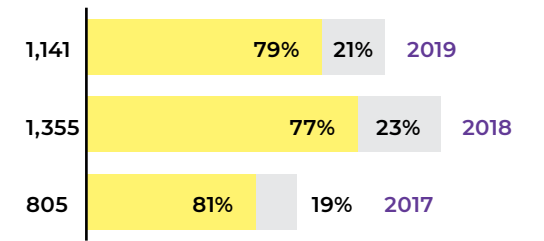
The Armenian ministry of education has set a target of having nearly 50 per cent of schools in the country **equipped with robotics labs**. From 2014 onwards, the government has also given tech start-ups preferential tax regimes, and easing the incorporation process. International companies like Microsoft, Cisco and IBM all have offices in Armenia and for years tech has been the biggest source of foreign investment in the country. Now, **Armenia boasts over 500 start-ups**, an impressive feat in a country of under three million people. Perhaps the most successful of these start-ups is photo editing app PicsArt, which in July 2020 reported over one billion downloads since inception.
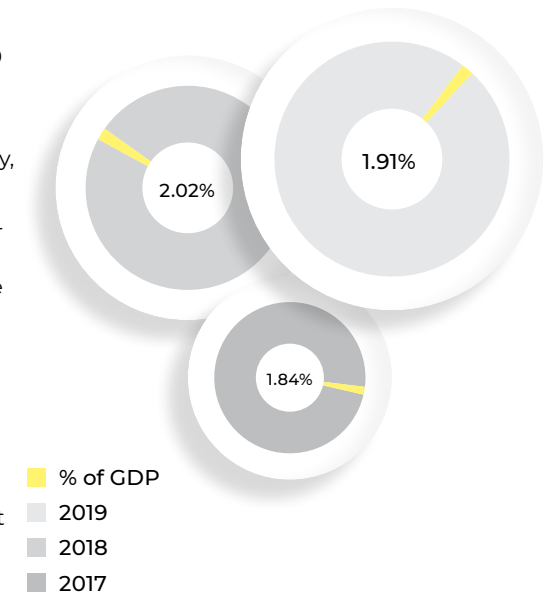
However, despite the progress, Armenia still lacks much volume of ICT exports. This can be explained by its relatively small population. Although Armenia, particularly in recent years, has become more hospitable to business activity, it still has some work to do in eradicating issues which have plagued many similar countries, like low standards of living. Nevertheless, between 2010 and 2016, the ICT sector's **output increased fivefold**. Between 2014 and 2019, the export of computer services rose particularly dramatically, increasing by 240 per cent.

According to the Enterprise Incubator Foundation, some 800 ICT companies, active in the software and services and the internet service provider sector, generated total revenue of 922 million US dollars in 2018 which was 20.5 higher than in 2017.

In the IT Competitiveness Index **Armenia ranks 15th** in the region. There is room for improvement as far as the command of English is concerned — Armenia is placed 51st in the EF EPI with only Azerbaijan being ranked lower across the emerging Europe countries. At the same time, Armenia boasts the **highest growth of employees** in the sector. The number grew by some 15 per cent between 2015 and 2019, with an increase of 49 per cent in 2019, compared to 2018. Both figures are the highest in the region.

ICT STUDENTS

4,796	90%	10%	2019
5,126	88%	12%	2018
4,418	85%	15%	2017

- bachelor and short-term
- master's and doctoral

ICT GRADUATES

1,141	79%	21%	2019
1,355	77%	23%	2018
805	81%	19%	2017

- bachelor and short-term
- master's and doctoral

ICT EXPORTS**

2.02% 1.91% 1.84%

- % of GDP
- 2019
- 2018
- 2017

ICT VALUE ADDED

3.22% 3.32% 3.34%

EXPORTS**

	2015	2016	2017	2018	2019
ICT services (millions, euros)	117.6	156.4	187.4	213.0	233.7
of which **computer services** (millions, euros)	74.4	119.2	146.6	164.1	198.3

**SOURCE: ITC, UNCTAD, WTO based on IMF statistics for 2015-2018 and estimated for 2019
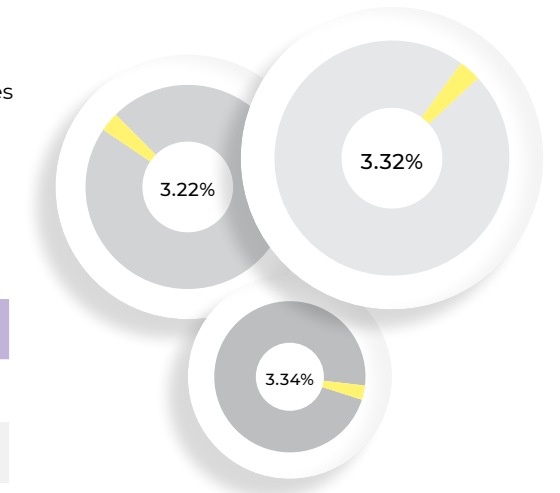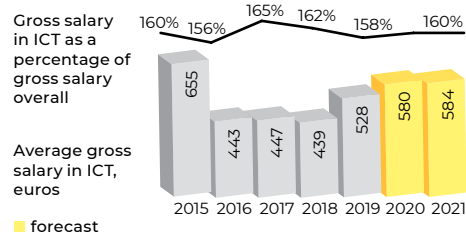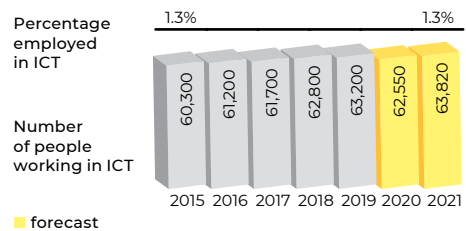
AZERBAIJAN

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
10.067	5,190,100	42,930	4,264	444%	1,344

Azerbaijan's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
34	44	104	56	88	86

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

160% 156% 165% 162% 158% 160%

Average gross salary in ICT, euros

655 443 447 439 528 580 584

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

1.3%   1.3%

Number of people working in ICT

60,300 61,200 61,700 62,800 63,200 62,550 63,820

2015 2016 2017 2018 2019 2020 2021

■ forecast

While Azerbaijan is a relative latecomer to the ICT sphere, it has made clear steps towards developing the industry. In 2016, the country's president Ilham Aliyev launched the **National Strategy for IT Development**, in which the administration laid out its intentions to diversify its oil-reliant economy by focusing on the ICT industry. Since then, more than 10 incubators have been established, including the US-based Founder Institute.

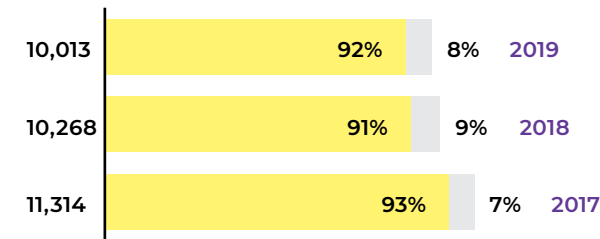Government policies have gone a long way in improving Azerbaijan's environment for ICT companies. In early 2019, a law came into effect exempting not only start-ups from tax duties, but also the workers themselves. This has both fueled desire to work in the industry and given companies a boost in the establishment phase. Furthermore, as a result of this government initiative, two high-tech parks have been constructed. These serve as incubators for up and coming ICT companies, as well as research and development institutes. Following others' examples, these high-tech parks also provide classes for school age children where they can learn skills which will benefit them and their country.

Now, Azerbaijan has **over 200 start-ups** in the country, the third most in the Commonwealth of Independent States. Most successful out of these is the free classified advertising app tap.az. 24 universities offer now courses in ICT and Internet penetration was at 80 per cent as of 2019, significantly higher than neighboring countries Armenia (65 per cent) and Georgia (69 per cent).

Despite this, not all the underlying figures bode well for Azerbaijan's ICT industry. While the number of ICT specialists in the country has slightly increased, the proportion of these workers to the rest of the workforce remains at a stagnant level, standing at just 1.3 per cent.
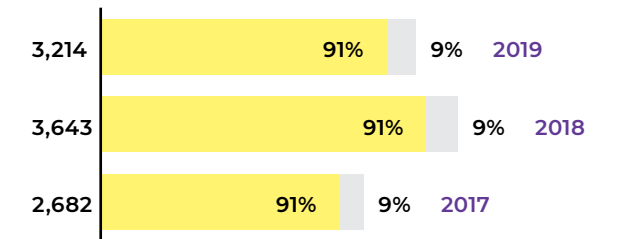
Although the sector as a whole has grown since 2010, it has been at a slower rate than the rest of the economy and 88 per cent of the sector's revenue in 2017 came from telecommunications alone. The more lucrative computer and information service sectors contributed to only seven per cent of the ICT sector's revenue the same year.

ICT exports have also declined from 78.3 million euros in 2015 to 52.2 million in 2019. Average ICT salaries are also relatively low, even when compared to countries of similar economic stature - and, more importantly, not significantly higher than the national average. This may reduce demand for working in this field. The government should take initiatives to reverse these trends and revitalise the ICT industry.
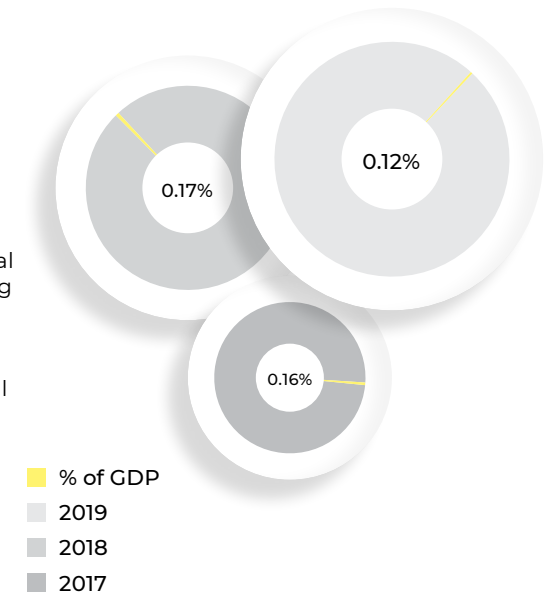
To sustain growth, Azerbaijan needs to invest further in innovation and diversify its economy by supporting and catalyzing entrepreneurship and research and development (R&D) across a broad range of potentially successful economic activities in the non-oil sector.

Recognising the need for innovation, the country has started to develop a national innovation system. The government shows a high level of commitment to innovation by preparing the national innovation strategy and establishing government bodies in charge of innovation policy, such as the Innovation Agency. Azerbaijan has made progress in developing digital government platforms and public sector innovation.
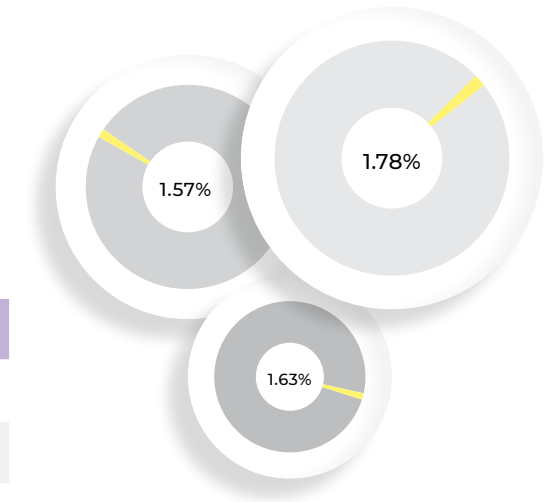
In the IT Competitiveness Index, Azerbaijan ranks 20th. With 99 ICT students per 100,000 people, Azerbaijan has the lowest percentage in the region. It is also ranked the lowest in the EF English Proficiency Index. Salaries in the sector remain **very competitive**. In 2019, the average was 528 euros, 19 per cent lower than in 2015.

ICT STUDENTS

10,013	92% 8%	2019
10,268	91% 9%	2018
11,314	93% 7%	2017

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

3,214	91% 9%	2019
3,643	91% 9%	2018
2,682	91% 9%	2017

■ bachelor and short-term
■ master's and doctoral

ICT EXPORTS**

0.17%   0.12%   0.16%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

1.57%   1.78%   1.63%

EXPORTS**

	2015	2016	2017	2018	2019
ICT services (millions, euros)	78.3	65.9	58.6	66.9	52.2
of which **computer services** (millions, euros)	15.9	7.0	5.3	5.7	11.1

**SOURCE: ITC, UNCTAD, WTO based on IMF statistics for 2015-2018 and estimated for 2019
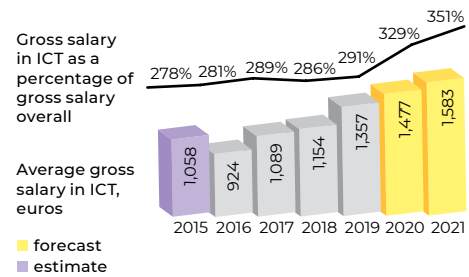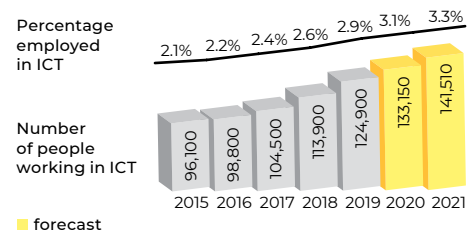
BELARUS

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
9.408	4,547,537	57,507	6,112	227%	1,155

Belarus' position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
49	88	47	38	53	40

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

278% 281% 289% 286% 291% 329% 351%

Average gross salary in ICT, euros

1,058 | 924 | 1,089 | 1,154 | 1,357 | 1,477 | 1,583

2015 2016 2017 2018 2019 2020 2021

■ forecast
■ estimate

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.1% 2.2% 2.4% 2.6% 2.9% 3.1% 3.3%

Number of people working in ICT

96,100 | 98,800 | 104,500 | 113,900 | 124,900 | 133,150 | 141,510

2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

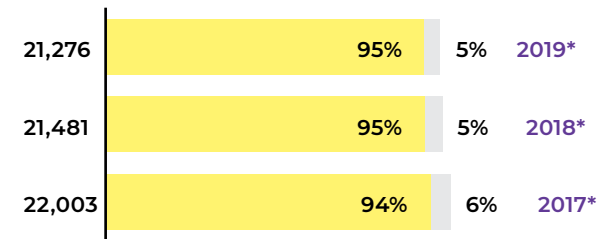| No.	Top Software Development	Top Mobile Development	Top IT Services
1	Itransition	iTechArt Group	*instinctools
2	N-iX	Syberry	ScienceSoft
3	iTechArt Group	Orangesoft	Itransition
4	Forte Group	Tapston	N-iX
5	Altoros	Intellectsoft	Code Inspiration

*SOURCE: Clutch Leaders Matrix

Belarus is an underrated tech giant. Although dwarfed in population size or reputation by some neighbouring countries, Belarus has nonetheless managed to secure a reputation as a reliable and sophisticated environment for the ICT industry. Radical government initiatives, like the unveiling of the **High-Tech Park** (HTP) near Minsk in 2006 allowed the country to build on a stable base to punch well above its weight in the ICT sphere. Although recent political events have thrown some doubts into the future of the industry, Belarus has undoubtedly come a very long way in a short time span.

The HTP functions both as a strategic incubator for ICT companies and as a tax haven. Companies signed onto it are exempt from all corporate tax and employees enjoy a 30 per cent income tax reduction. The impressive growth of the Belarusian ICT industry is reflected in the increase in companies registered with the HTP: this number went from 388 companies in October 2018, to **969 in October 2020**. The number of employees working for HTP-registered companies rose from 30,000 to over 65,000 in the same period.
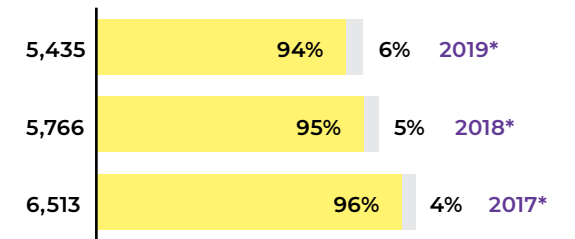
At the end of 2016, the country's president, Alexander Lukashenko, signed a decree on the development of the digital economy, thus making Belarus the first world's jurisdiction with overall legal regulation of businesses based on blockchain technology. Its main goal was to create such conditions that would make world class IT companies want to come to Belarus, opening representative offices, development centres and creating popular products for the world.

As a result, Belarus now has a number of well-established ICT companies and software successes under its belt. Messaging service Viber did much of its initial development in Belarus (and has a Belarussian co-founder). Wargaming, the company behind the well-known online multiplayer game *World of Tanks* was founded in Belarus. International heavyweights like Google and Yandex operate research and development offices in Minsk. Companies like IBA Group and SolbegSoft, listed in **the IAOP Top Outsourcing 100**, have their delivery centres in Belarus.
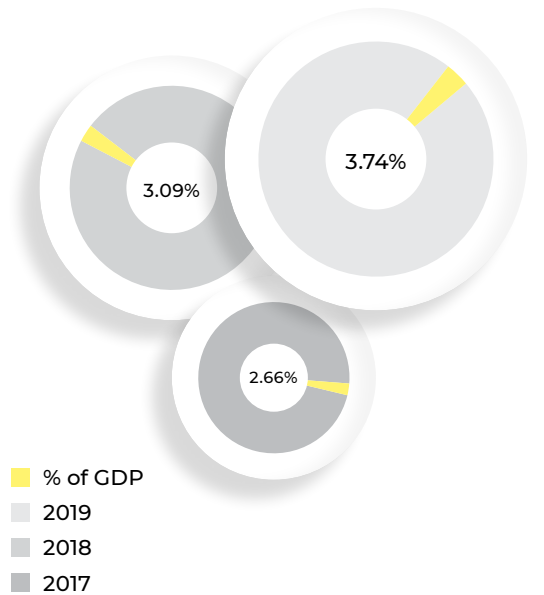
Salaries in ICT are considerably higher than the average (while lower than in most of the West), allowing Belarus to simultaneously retain its top talent and attract foreign investors. It has also become an up and coming outsourcing destination, with over 60 per cent of national ICT companies servicing this market.
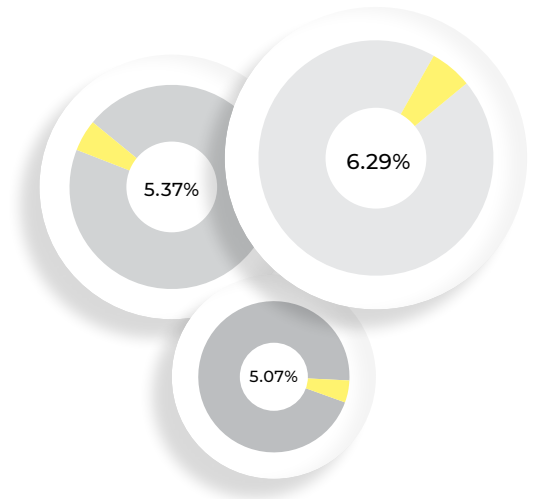
The protests of 2020 that followed a disputed presidential election were predicted to heavily impact the ICT sector. With opposition parties finding their greatest support base among the young, relatively well-off and cosmopolitan people who tend to work in the tech industry, it was projected that many companies would become disillusioned with the political process and relocate. However, the protests have since petered out, returning a modicum of stability and predictability — for now.

In the IT Competitiveness Index Belarus ranks 14th. The country has made huge strides in the past decade in the ICT sphere. The number of people employed in it has grown from just over 90,000 in 2014 to **125,000 in 2019**. ICT exports have seen a dramatic increase 215 per cent in the same period, now making up 3.74 per cent of the country's GDP. However, rather paradoxically, the number of ICT students enrolled has been dropping over the last few years. Furthermore, if Belarus continues to be alienated from the rest of Europe for political reasons, the ICT sector could well be harmed.

ICT STUDENTS

21,276	95%	5%	2019*
21,481	95%	5%	2018*
22,003	94%	6%	2017*

■ bachelor and short-term
■ master's and doctoral
* estimate

ICT GRADUATES

5,435	94%	6%	2019*
5,766	95%	5%	2018*
6,513	96%	4%	2017*

■ bachelor and short-term
■ master's and doctoral
* estimate

ICT EXPORTS

3.09%
3.74%
2.66%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

5.37%
6.29%
5.07%

EXPORTS

	2015	2016	2017	2018	2019
ICT services (millions, euros)	905.1	1,047.5	1,289.6	1,572.9	2,149.6
of which **computer services** (millions, euros)	733.5	866.2	1,068.5	1,346.1	1,893.1

SENLA
SOFTWARE ENGINEERING LABORATORY

Software Engineering Laboratory

Clutch
- **#1** TOP BELARUS CRM Developers
- **#2** TOP BELARUS Salesforce Consulting Companies

TOP DEVELOPMENT Clutch COMPANIES 2020

BEST SALESFORCE AGENCIES DESIGNRUSH.com

TopDevelopers The Genuine Quality — Top Custom Software Developers — 2020

INDUSTRIES:

Financial Consulting Services	**Logistics & Transportation**	**Pharmaceutical & Healthcare**
Oil & Gas	**Manufacturing Software Development**	**Betting & Gambling**

SERVICES:

Software Consulting
- Technical audit
- Systems integration
- GDPR consulting

Software Custom Development
- Enterprise software development
- Startup software development
- Support and maintenance of systems

Web Development
- Web application development
- Web portals
- Public web services

Mobile Development
- Android and iOS app development
- Mobile application design
- Mobile application QA

Salesforce Development
- Salesforce consulting
- Salesforce customization
- Salesforce integration
- Salesforce migration

UI/UX
- UI/UX development
- UI/UX audit
- Usability testing

Blockchain
- Blockchain consulting
- Blockchain development
- ICO development services

AI & ML Development Services
- Interactive chatbots
- Image processing and object recognition
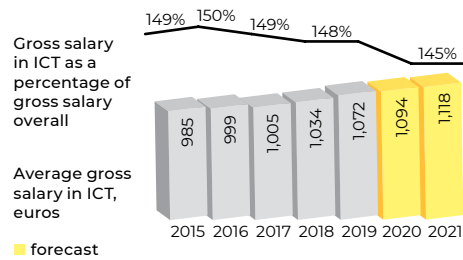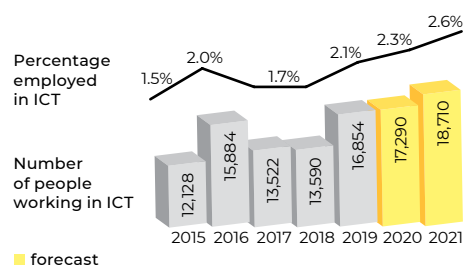- Voice-based AI

BOSNIA AND HERZEGOVINA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
3.491	952,291	18,013	5,160	207%	472

Bosnia and Herzegovina's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 72) (2016)
90	82	66	62	73	26

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

149% 150% 149% 148% 145%

Average gross salary in ICT, euros

985 999 1,005 1,034 1,072 1,094 1,118

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

1.5% 2.0% 1.7% 2.1% 2.3% 2.6%

Number of people working in ICT

12,128 15,884 13,522 13,590 16,854 17,290 18,710

2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

No.	Top Software Development	Top IT Services
1	JSGuru	Cron d.o.o.
2	ABC Tech Group	itMedia
3	Everest Consulting	Everest Consulting
4	ITO	Saburly
5	Codaxy	NEX Studio

*SOURCE: Clutch Leaders Matrix

ICT STUDENTS

6,035	90%	10%	2019
6,331	91%	9%	2018*
6,390	93%	7%	2017*

■ bachelor and short-term
□ master's and doctoral
* estimate

ICT GRADUATES

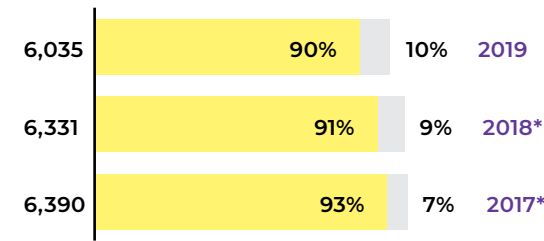| 822 | 82% | 18% | 2019 |
| 852 | 84% | 16% | 2018* |
| 844 | 88% | 12% | 2017* |

■ bachelor and short-term
□ master's and doctoral
* estimate

Bosnia and Herzegovina's (BiH) ICT industry has slowly but surely been finding its feet, particularly over the last three or four years. Although its government has been slow to recognise and act on the potential that this industry holds, the necessary elements for a vibrant ICT sphere have gradually been coalescing. A steady proliferation of educational programmes, incubators and foreign investment has occurred in recent years, and with the vast growth potential of the fledgling industry, there are reasons to be optimistic about the development of ICT in BiH. However, the nation is hampered by its small size and relative lack of government support for the industry.

Despite the recent progress, BiH still lacks sufficiently accommodating laws and policies to allow the ICT industry to truly take off. There is still no special tax regime for such companies, increasing the barriers to entry. It doesn't offer any specialised ICT visas either, the way many other countries do, preventing it from attracting international talent. Few Bosnian start-ups and ICT companies have made waves outside their borders. Furthermore, even relative to its size, the nation has few ICT specialists, thus setting a hard limit on how far the industry can grow.

In 2014, Bit Alliance, an umbrella association of ICT companies based in the country, partnered with the European Bank for Reconstruction and Development to found the 'ICT Boot Camp', a six-month long intensive training programme for the ICT sphere. This was the first such initiative in the country, whose government spends only 0.04 per cent of its investment on the ICT industry, compared to the global average of 2.7 per cent.
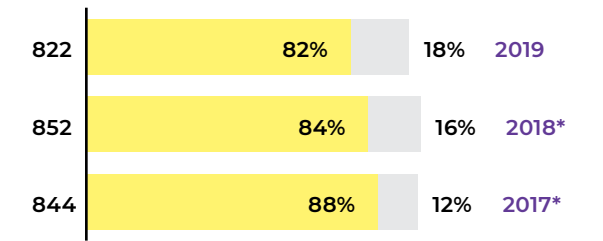
Since then, companies like Kliker and Robokids have followed suit, offering programming, coding and robotics classes to school age children. In 2019, companies in the BiT signed onto a strategic document known as the **IT manifesto** which targeted an improvement in the educational, legislative and economic conditions to allow the ICT industry to truly take off. In 2018 and 2019, the University of Sarajevo began offering a two-year ICT programme, at the initiative of BIT, creating 150 additional spaces for aspiring ICT specialists. Several high schools around the country also began preparing their students for careers in the ICT field by offering elementary coding and software classes.

According to the Foreign Investment Promotion Agency (FIPA), the future of the ICT sector in BiH is dependent on three strategic objectives: restructuring of the edu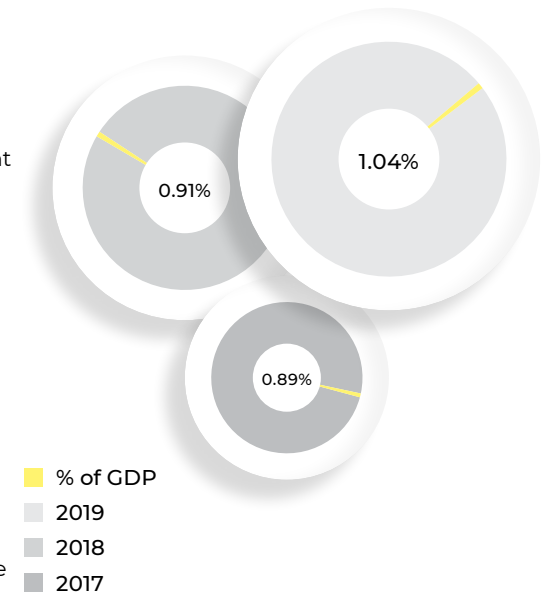cation system, improving the business environment for the support of IT sector development through the establishment of an IT development council, changes to legislation, the establishment of funds and finding ways to implement a wide range of tax incentives or subsidising certain activities.

Despite the limitations, Bosnia's ICT industry still continues to develop at a steady pace. ICT exports increased from just over 109 million euros in 2015 to **187.5 million euros in 2019**. The percentage of ICT specialists in the workforce also increased from 1.5 per cent to 2.6 per cent in the same timeframe. Thus, progress has undoubtedly been made — but to accelerate this progress and take the nation to new heights, Bosnia still has steps to make, particularly in creating a viable business environment.

In the IT Competitiveness Index, **Bosnia and Herzegovina ranks 21st**. There are 483 IT specialists per 100,000 which makes the country placed lowest across emerging Europe. However, the figure is growing at over 10 per cent per annum.

ICT EXPORTS

0.91%
1.04%
0.89%

□ % of GDP
□ 2019
□ 2018
□ 2017

ICT VALUE ADDED

4.12%
4.19%
4.24%

EXPORTS

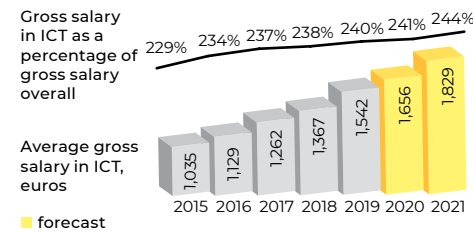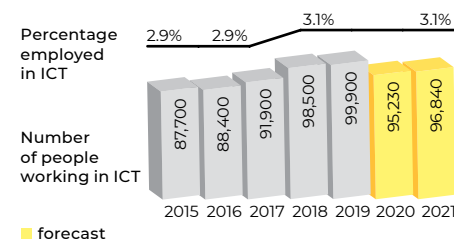|	2015	2016	2017	2018	2019
ICT services (millions, euros)	109.6	123.5	142.9	156.1	187.5
of which **computer services** (millions, euros)	32.0	58.7	83.4	101.1	137.6

BULGARIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
6.951	3,375,900	61,239	8,809	229%	1,092

Bulgaria's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
61	36	43	49	56	20

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall: 229% 234% 237% 238% 240% 241% 244%

Average gross salary in ICT, euros: 1,035 1,129 1,262 1,367 1,542 1,656 1,829
(2015 2016 2017 2018 2019 2020 2021)

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT: 2.9% 2.9% 3.1% 3.1%

Number of people working in ICT: 87,700 88,400 90,916 98,500 99,600 95,230 96,840
(2015 2016 2017 2018 2019 2020 2021)

■ forecast

CLUTCH TOP PROVIDERS*

No.	Top Software Development	Top Mobile Development	Top IT Services
1	MentorMate	Folio3	SoftServe
2	Coherent Solutions	Futurist Labs	Adastra
3	Infopulse	UPlanet Inc	Accedia
4	Dreamix	Coherent Solutions	Melon
5	Flat Rock Technology	Vola Software	Infopulse

*SOURCE: Clutch Leaders Matrix

ICT STUDENTS

12,376	82% — 18%	2019
11,502	82% — 18%	2018
10,936	81% — 19%	2017

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

2,084	66% — 34%	2019
2,055	63% — 37%	2018
2,127	61% — 39%	2017

■ bachelor and short-term
■ master's and doctoral

ICT EXPORTS**

2.19% 2.58% 1.95%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

5.89% 6.53% 5.27%

Bulgaria is a country which has made real progress in the ICT industry. In the early 1980s, Bulgaria emerged as an unlikely computing hub. At some points, as many as 40 per cent of computers produced in the Eastern Bloc were produced in Bulgaria, with the country becoming the third largest producer of computers per capita in the world. Although the collapse of communism saw the accompanying demise of Bulgaria's **iconic Pravetz 82 computer** for copyright reasons, the tech culture was already ingrained in the population.

Building on this relatively long history of high-tech work, Bulgaria became an outsourcing hub in the 2000s and early 2010s. Following its accession to the European Union in 2007, the ICT industry benefited from access to a broader market and the 2010s saw an explosion of start-ups. Some estimates claim as many as 2,000 start-ups were founded between 2013 and 2018. To this day, Bulgarian schools focus heavily on maths and science and orient their students towards work in STEM fields. Some schools offer **AI classes for students as young as 15**. Bulgaria also has the distinction of having Europe's fastest broadband speed – the world's second fastest, after only South Korea.

These factors give Bulgaria a strong base on which to build its ICT industry. Bulgaria also has by far the highest proportion of female workers in the ICT industry in the European Union, with **27 per cent of the workforce being female**.
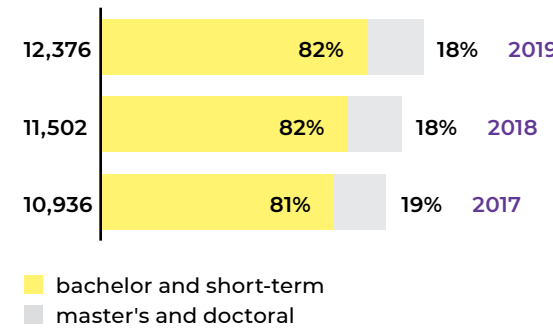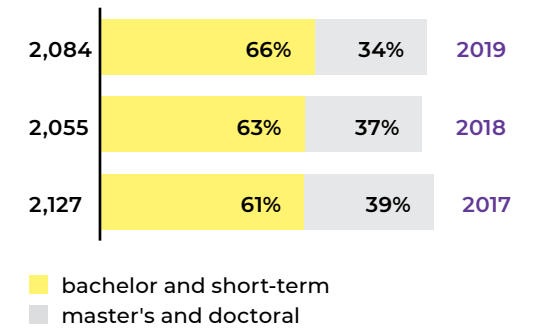
In recent years, Bulgaria and its capital of Sofia in particular have become major hubs in fintech. In 2018, fintech company Cash Credit raised nearly 19 million euros in funding.

Bulgaria also has a remarkably low flat tax rate of ten per cent, making it an attractive place for investment. Despite this, however, Bulgaria still lacks a preferential tax regime for start-ups or ICT companies. This somewhat hampers the development of the industry, and a common complaint from start-up founders is the lack of access to funds and the tight labour market. However, the Bulgarian government seems to be aware of the steps it needs to take to rectify such issues: for example, it has proposed introducing a start-up visa, following other countries' successful examples.

Between 2015 and 2019, Bulgaria's **ICT exports more than doubled** from 788 million euros to over 1.6 billion euros, highlighting the impressive rate of growth in the industry. Salaries in ICT have also steadily increased, mitigating a long-standing brain drain problem which intensified after accession to the European Union. Despite the unwanted label of being the most corrupt EU country in 2018, the ICT industry is flourishing. Since then, there has been a substantial number of foreign companies opening their own service centres and capital investments for local tech start-ups.

Export-oriented businesses and new entrants are harvesting local government attention and receiving incentives to create new, well paid jobs. Nevertheless, the country's legislation and incentivisation policies have to accelerate to keep up with other, neighbouring states.

In February 2021, IT professionals were classified as essential workers and put in the priority group for Covid-19 vaccination.

In the IT Competitiveness Index Bulgaria ranks 12th. There are 30 ICT graduates per 100,000 people, compared to the weighted average of 46 across the Western Balkans and 81 Albania, which is the highest in the entire emerging Europe region.
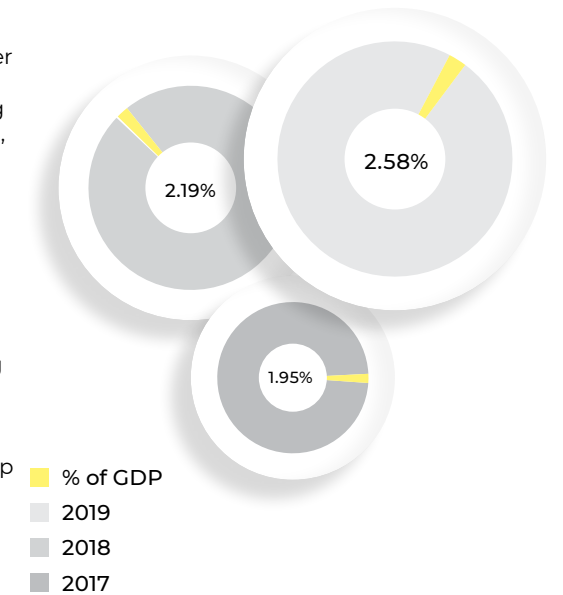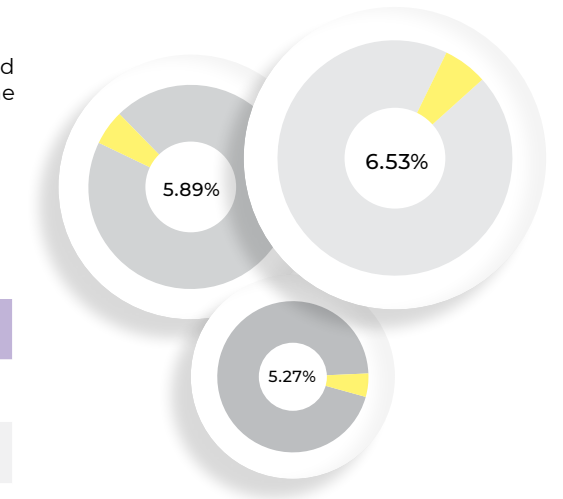
EXPORTS**

	2015	2016	2017	2018	2019
ICT services (millions, euros)	788.5	983.3	1,020.7	1,231.1	1,578.8
of which **computer services** (millions, euros)	521.0	662.3	652.9	837.8	1,094.3

**SOURCE: ITC, UNCTAD, WTO based on IMF statistics for 2015-2018 and estimated for 2019
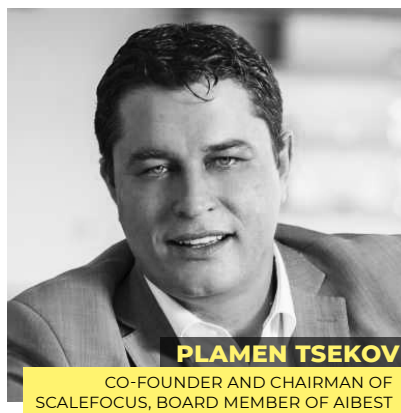
IT IN BULGARIA

The emerging and powerful tech ecosystem

An increase in IT talent is driving the growth of Bulgaria's digital services industry.

PLAMEN TSEKOV
CO-FOUNDER AND CHAIRMAN OF
SCALEFOCUS, BOARD MEMBER OF AIBEST

Bulgaria has established a formidable brand on the global tech scene over the past few years, and now has a profound influence in the international IT ecosystem.

Ambitious tech companies have become prominent and sought-after partners, as the local IT industry becomes even more mature, sustainable, and attractive for talent. The software development and ITO sectors in Bulgaria have managed to sustain stable growth numbers, and the country continues to see an increasing number of major international businesses entrust local partners. Many are setting up shop in Bulgaria themselves, in order to establish teams or whole areas of operations in this thriving location.

With Covid-19 impacting businesses last year, software development companies in the country reorganised quickly and without any service continuity gaps, perfecting this reorganisation rapidly afterwards. Furthermore, the industry managed to support the efforts of local government, with AIBEST (the Association for Innovation, Business Excellence, Services, and Technology) donating a significant amount of work hours for the quick creation of specialised Covid-19 related information systems, mobile apps, and chatbots.

RAISING IT TALENT CAPACITY IN THE NEW ENVIRONMENT

In macroeconomic terms, Bulgaria's technology and business services sectors have generated a sustainable trend of about 20 per cent year-on-year growth for the last few years, according to AIBEST. The IT sector's contribution to Bulgaria's GDP is expected to rise to 4.7 billion euros or 8.9 per cent of GDP in 2022 (compared to the 2.9 billion euros, or 5.5 per cent of GDP reported in 2019).

Consequently, the demand for a skilled IT workforce continues to rise. The industry is attempting to respond to its own needs by partnering with traditional educational institutions, as well as by establishing its own projects such as the Telerik and Scalefocus Academies, the latter organised entirely online and accepting applicants across Bulgaria and North Macedonia, offering personal mentors, significant practical experience, and preparation to start working immediately after graduation.

More importantly, such academies allow those willing to step into a new career to retrain; many people with unique skills from other fields seek to enter the IT sector because of the steady and agile working environment, international projects, and innovative practices. The number of these people keeps rising, as other traditional services sectors (tourism and hospitality, to name just two) do not provide a similar earning potential, a process catalysed by Covid-19, but also as people with careers as civil engineers, architects, and military personnel decide to use their background and skills in IT engineering roles.

Overall, a strong tradition in STEM education in Bulgaria allows for a steady flow of new professionals in the industry.

The educational system meanwhile adapted quickly to distance learning, which allowed the IT business to participate more actively in energising and shaping young talent.

AMBITIONS FOR FURTHER GROWTH

Bulgaria's IT industry is now recognised locally as an important economic backbone, supporting the middle class and assuring non-disruptable, high quality services exports.

The challenges of the future offer many more opportunities – in 2020 IT industry growth was 10 per cent, with expectations that this will be significantly exceeded in 2021. According to an Everest Group study, presented at the Global Technology and Business Services Summit in December 2020, Eastern Europe is the top go-to talent destination for enterprise buyers.

The current focus of the leading regional tech companies such as Scalefocus remains clear: to flawlessly fulfill the increasing need for technology innovation and digital transformation services, by taking advantage of the regional talent and the new way of engagement across multiple locations.

Bulgaria, being part of the EU and NATO and the leading tech hub in Southeastern Europe, has also managed to attract top IT talent from neighbouring countries. Companies are increasingly using a hybrid model of engagement to retain, develop and attract workers, even from outside national borders. The Covid-19 measures, as well as Brexit, sparked the physical return of a serious number of IT professionals, who had emigrated in previous decades.

The fast business adaptation in 2020 along with good performance and an innovative spirit presents a strong foundation for IT services growth in 2021, not only in Bulgaria but in neighbouring countries as well.
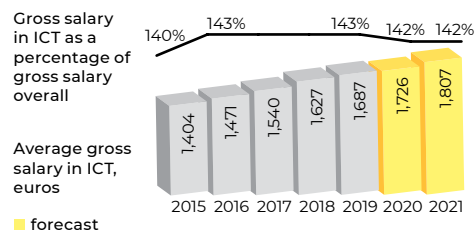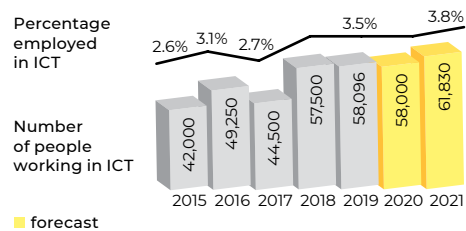
CROATIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
4.058	1,798,750	54,270	13,373	159%	1,219

Croatia's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
51	84	39	40	43	13

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

140%   143%   143%   142%   142%

Average gross salary in ICT, euros

1,404   1,471   1,540   1,627   1,687   1,726   1,807

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.6%   3.1%   2.7%   3.5%   3.8%

Number of people working in ICT

42,000   49,250   44,500   57,500   58,096   58,000   61,830

2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

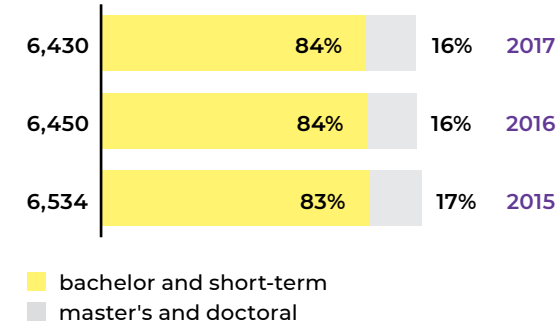| No.	Top Software Development	Top Mobile Development	Top IT Services
1	Agency04	Clover Studio	Sysbee
2	Infinum	Infinum	IDE3
3	Q agency	Factory	Spyrosoft
4	Ars Futura	Q agency	Serengeti
5	CoreLine	CoreLine	Comminus

*SOURCE: Clutch Leaders Matrix

Croatia is an underrated hotspot in the ICT industry and its tech industry has managed to flourish with several exciting and innovating projects originating from the country.

According to the European Union (EU) Digital Economy and Society Index (DESI) 2018, Croatia ranks 22nd out of the 28 member states. The use of internet services in Croatia is well above the EU average, with news, video calls, music, videos and games being the most used services. However, Croatian businesses are slow in the integration of digital technology, ranking 21st in the EU. The use of cloud technologies, at 22 per cent, is above the EU average, but for electronic information sharing, it is in the bottom five EU countries.

Croatia has a highly-educated, multilingual population, with more than half of the workforce proficient in English. A member of the European Union since 2013, Croatia has capitalised on this opportunity to solidify its position as a centre of innovation.

Croatia is estimated to have **139 start-ups**. Perhaps most exciting among these is Rimac Automobili, which is working on building the world's fastest electric car. Furthermore, the little-known but ubiquitous IT and telecommunications company Infobip operates two global headquarters in Croatia. Infobip, which provides services like automated messaging for companies, counts established institutions like Uber and WhatsApp among its clients. Such a company having two headquarters in Croatia is an undeniable endorsement of the country's ICT talent. Another innovative ICT company based in Croatia is Gideon Brothers, which is developing autonomous robots for factories and warehouses, signifying Croatia's entrance into the rapidly growing AI field.

According to the Stackoverflow data, there were some **35,300 developers** in Croatia in 2019.
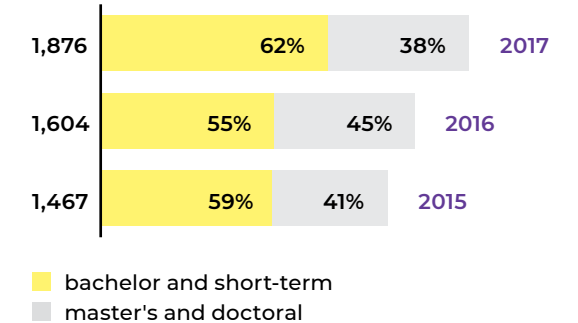
What makes Croatia's progress in these fields even more impressive is how this is accomplished in the face of a sluggish bureaucracy. Entrepreneurs have to go through as many as 314 administrative procedures to run a business — although the government has promised to simplify these. Furthermore, Croatia does not have a specialised tax regime for ICT companies, nor does it offer a start-up visa, both policies which have proven results in other countries. Such policies may be needed, particularly for Croatia to overcome its demographic limitations.

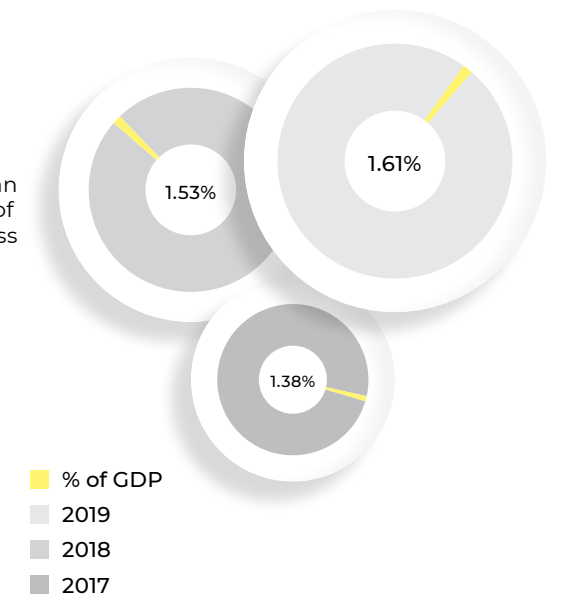Most statistics, however, bode well for Croatia's ICT industry.

The sphere has seen a boost in 2020, despite the Covid-19 pandemic. ICT exports steadily increased from 485.8 million euros in 2015 to over 875 million euros in 2019. Furthermore, Croatia has a largely multilingual workforce, ranking 14th in the world in EF's English Proficiency Index. Although bureaucratic restrictions still pose an obstacle to the unfettered growth of the ICT industry, Croatia nonetheless has made an impressive start.
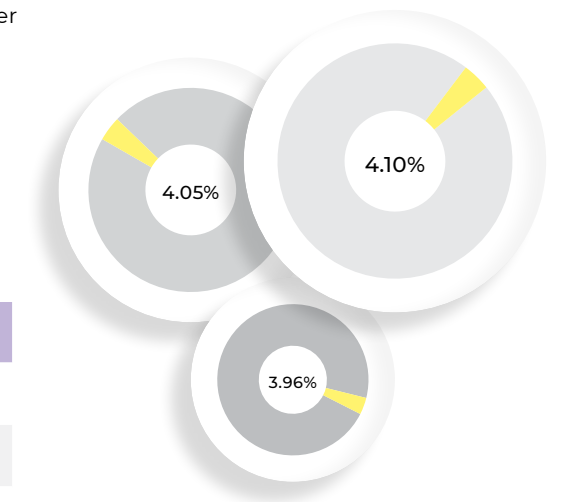
According to Ookla, the average download speed of broadband internet in Croatia was 46.76 Mbps in December 2020.

In the IT Competitiveness Index, **Croatia is ranked 9th**. It boasts the highest EF EPI position in the emerging Europe region (13th). The average annual growth of the number of people employed in ICT per 100,000 between 2015 and 2019 accounted for 10.3 per cent and is the fourth highest figure in the region. At the same time, the number of ICT graduates per 100,000 people amounts to 34, lower than the neighbouring Western Balkans countries where the average is 46.

ICT STUDENTS

6,430	84%	16%	2017
6,450	84%	16%	2016
6,534	83%	17%	2015

■ bachelor and short-term
☐ master's and doctoral

ICT GRADUATES

1,876	62%	38%	2017
1,604	55%	45%	2016
1,467	59%	41%	2015

■ bachelor and short-term
☐ master's and doctoral

ICT EXPORTS

1.53%   1.61%   1.38%

■ % of GDP
☐ 2019
☐ 2018
☐ 2017

ICT VALUE ADDED

4.05%   4.10%   3.96%

EXPORTS

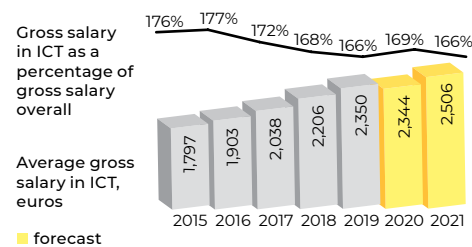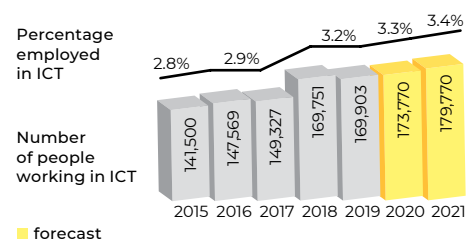|	2015	2016	2017	2018	2019
ICT services (millions, euros)	485.8	598.4	678.3	796.6	875.5
of which **computer services** (millions, euros)	378.2	455.9	524.0	623.6	674.7

CZECHIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
10.694	5,412,170	223,939	20,941	177%	6,768

Czechia's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
41	23	25	22	27	19

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall: 176% (2015), 177% (2016), 172% (2017), 168% (2018), 166% (2019), 169% (2020), 166% (2021)

Average gross salary in ICT, euros: 1,797 (2015), 1,903 (2016), 2,038 (2017), 2,206 (2018), 2,350 (2019), 2,344 (2020), 2,506 (2021)

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT: 2.8% (2015), 2.9% (2016), 3.2% (2018), 3.3% (2020), 3.4% (2021)

Number of people working in ICT: 141,500 (2015), 147,569 (2016), 149,327 (2017), 169,751 (2018), 169,903 (2019), 173,770 (2020), 179,770 (2021)

■ forecast

CLUTCH TOP PROVIDERS*

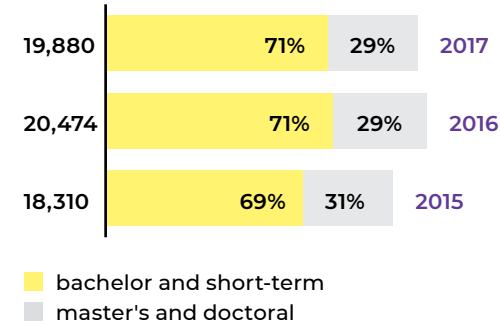| No.	Top Software Development	Top Mobile Development	Top IT Services
1	Limestone Digital	STRV	Adastra
2	Sprint Innovations	Ackee	Innoware
3	STRV	Cleevio	Sciant
4	Cleverance Enterprise Solutions a.s.	INLOOPX by Avast	Strix
5	Business Logic	ADAMAPP	First Line Software

*SOURCE: Clutch Leaders Matrix

Czechia is another country which has made impressive progress to develop a well-established ICT sector. With the country ranking in the top 20 worldwide for percentage of GDP invested in research and development, the ICT industry has capitalised on this.

Czechia remains much cheaper in labour and operating costs than most other European Union countries, giving it a competitive edge over the likes of Germany.
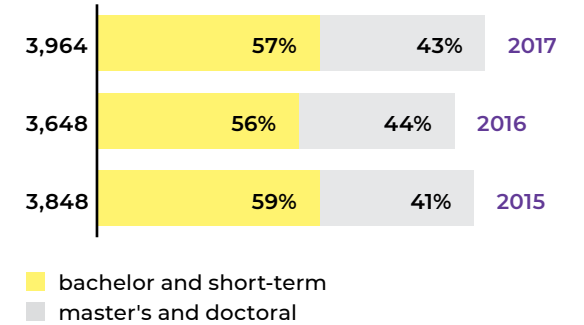
Czechia has a long standing history of proficiency in technical fields. It has an automobile making tradition going back over a century, as well as being the homeland of the inventors of contact lenses. This already establishes a tradition of industry and innovation. Now, some of the most well-known software companies come from the Czechia. Antivirus giants Avast and AVG were both founded and are headquartered in the country, alongside the software company behind the video game Mafia. Perhaps the most well-known export of the country's ICT sector is the world-famous online multiplayer game ARMA which is developed by Bohemia Interactive. In recognition of the talent in the country, IBM, Microsoft, Google and Oracle all have research and development offices in the Czechia.

Czechia has a moderate 19 per cent corporate tax rate. Business registration is simple, with minimal capital needed to be able to register. There is also the possibility for foreigners to apply for a start-up visa, allowing them to live in the country long-term. Czechia has undoubtedly benefited from this: 20 per cent of start-ups in the country have foreign founders.

Czechia is estimated to have as many as **900 start-ups**, with particular concentration in the gaming, entertainment and travel sub-sectors. There is a weaker investment environment to incentivise the creation and financing of new projects, but there is partial support for start-up projects through the state CzechInvest agency, through incubation and acceleration programmes.

Although Czechia has a relatively high number of ICT specialists per capita, the supply of labour still struggles to keep up with demand. This is a good sign, as it shows that despite the country's small population, the ICT industry grows at a fast pace. Because of this, Czechia also offers work visas to ICT specialists from a select group of countries, including the up and coming ICT powerhouse Ukraine and far-flung nations like Mongolia.
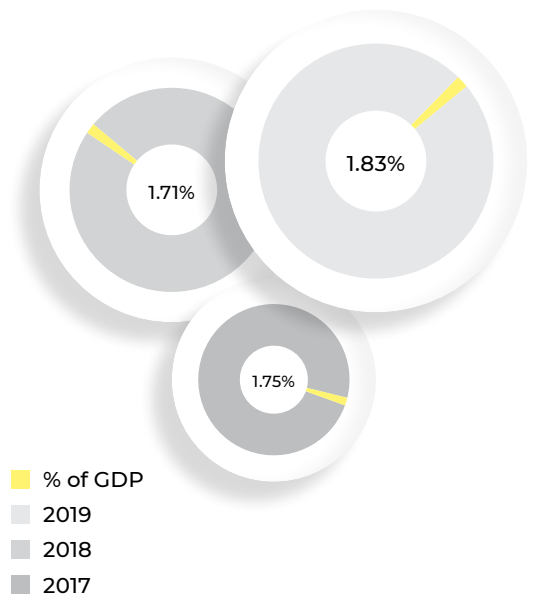
Exports of ICT services have dramatically increased in the space of just five years: from 2014 to 2019, this figure more than doubled, now generating over four billion euros per annum and contributing to 1.8 per cent of the GDP. Czechia is undoubtedly one of Europe's major players in the ICT industry, and if it continues down its current path, the future bodes well for the industry.
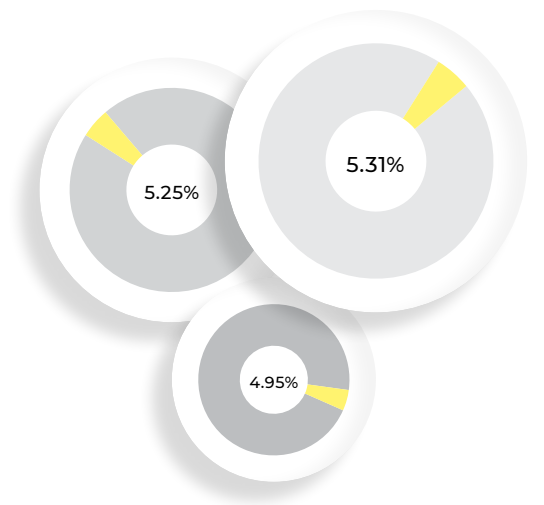
Czechia has the ambition to become an innovative leader in Europe. The government has adopted an Innovation Strategy and committed itself to increasing public spending on innovation to 2.5 billion euros over the next 10 years. **In 2025, it should reach 2.5 per cent of GDP**, and three per cent of GDP in 2030.

In the IT Competitiveness Index, **Czechia ranks third** across emerging Europe. The average salary in the sector is the second highest in the region, after Slovenia, and **amounts to 2,350 euros**. At 1,111 euros, the value added of the ICT sector per capita is the second highest in the emerging Europe region. Moreover, the number of people working in the ICT sector per 100,000 people is the third highest in the region.

ICT STUDENTS

19,880	71%	29%	2017
20,474	71%	29%	2016
18,310	69%	31%	2015

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

3,964	57%	43%	2017
3,648	56%	44%	2016
3,848	59%	41%	2015

■ bachelor and short-term
■ master's and doctoral

ICT EXPORTS

1.71%
1.83%
1.75%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

5.25%
5.31%
4.95%

EXPORTS

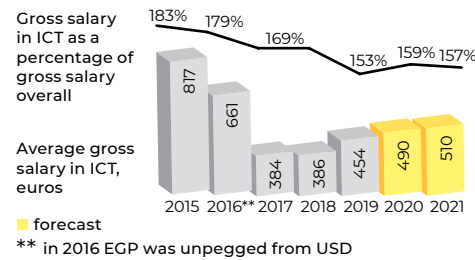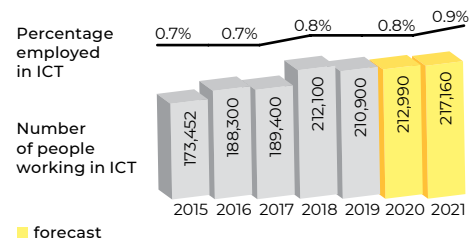|	2015	2016	2017	2018	2019
ICT services (millions, euros)	2,474.3	2,936.1	3,391.8	3,614.2	4,095.8
of which **computer services** (millions, euros)	2,014.9	2,314.4	2,600.7	2,848.7	3,433.8

EGYPT

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
98.101	28,348,200	294,570	3,003	209%	8,048

Egypt's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
114	142	112	-	116	83

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

183% 179% 169% 153% 159% 157%

Average gross salary in ICT, euros

817 699 384 386 454 490 510

2015 2016** 2017 2018 2019 2020 2021

■ forecast
** in 2016 EGP was unpegged from USD

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

0.7% 0.7% 0.8% 0.8% 0.9%

Number of people working in ICT

173,452 188,300 189,400 212,100 210,900 212,990 217,160

2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

No.	Top Software Development	Top Mobile Development	Top IT Services
1	Blink22	Enozom Software	UTrust for Software Testing Services
2	Rubikal	Blink22	Sceel.io GmbH
3	WPExperts	Intcore	Seven Dynamic
4	Pharaoh Soft	Rubikal	Azdan
5	MobileStudio	Pharaoh Soft	Sumerge

*SOURCE: Clutch Leaders Matrix

Egypt is one of the few countries in Africa and the Middle East that is taking concrete steps towards vastly improving its ICT industry. It has an enormous population, the biggest in the MENA region and the third-biggest in Africa. Like most African countries, it has a large youth bulge, with a median age of just 24. With the second largest population of internet users in Africa, Egypt is arguably better positioned than any other country on the continent to take on the mantle of the continent's leader in the ICT industry.
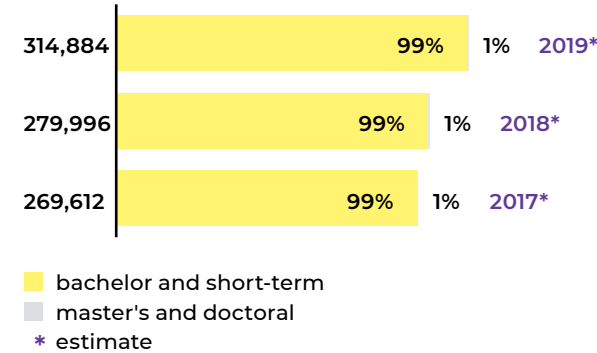
The ICT sector has for many consecutive years been growing at a double-digit rate and exports of ICT services have been steadily rising. According to the International Data Corporation (IDC), the combined IT, BPO, and KPO export market is forecast to grow from 3.2 billion US dollars in 2017 to **4.7 billion US dollars in 2020**.

As the Covid-19 pandemic continues to take an escalating toll on economies across the world, Egypt has proven its resilience by effectively mitigating the impact on businesses and propelling them into digitisation. In 2019, the government invested **two billion US dollars in infrastructure upgrades**; this has played a key role in sustaining the surge in demand caused by the pandemic. Egypt has been cited by the International Monetary Fund as the only country in MENA to witness positive real GDP growth in 2020.
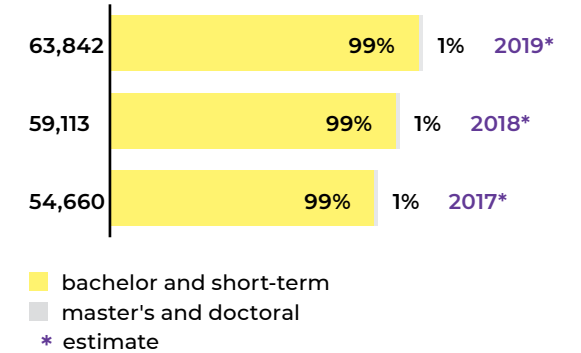
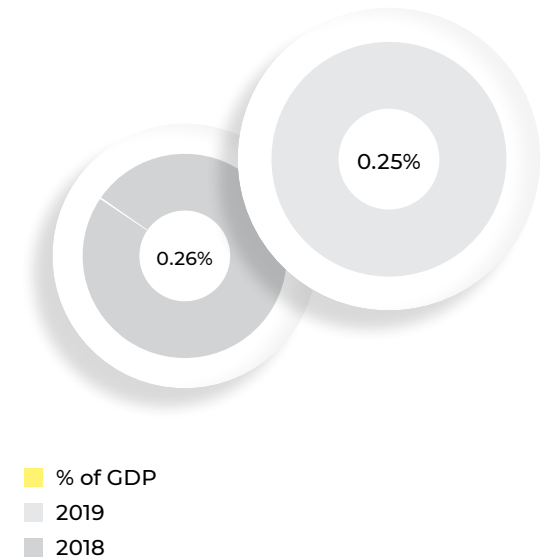The Ministry of Communications and Information Technology is driving the digitisation of the economy through its "Digital Egypt" strategy that focuses on innovation, digital skills and jobs and digital transformation. The ministry is offering an array of skills development programmes delivered in partnership with tech providers like Amazon, Google, and Microsoft. The most recent Egypt FWD (Future Work is Digital) initiative aims to **train 100,000 young Egyptians on in-demand ICT skills**. Building on the success of Cairo's startup ecosystem, which attracts the highest number of investment deals in Africa, the government is establishing innovation hubs in public universities across second tier cities. Furthermore, the government is building a New Administrative Capital, around 70 kilometres outside Cairo, to be a self-sustaining 'smart city', hosting **the Knowledge City with R&D centres and international technology universities**. The country has also recently passed its data protection law, which is similar to the EU's GDPR.

Egypt has a competent multilingual workforce. The country holds the **15th position in the TopCoder ranking**, which is higher than most countries in the emerging Europe region. This workforce, which can contribute to all levels of the value chain at competitiv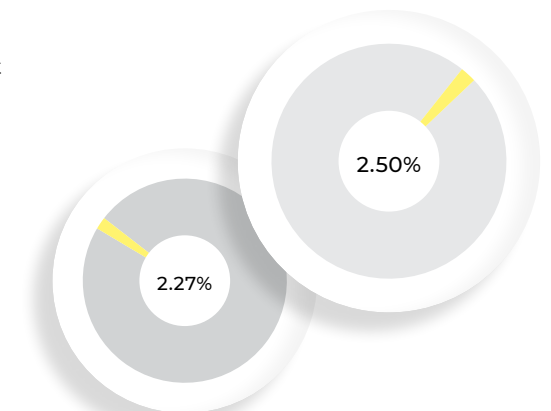e costs, has caught the attention of several multinational companies. The country has been supporting the expansion of leading European companies including Vodafone's Worldwide Technology Centre of Excellence, Ericsson's AI & Analytics hub, and Valeo's Software R&D Centre.

Despite not being officially included in Emerging Europe's IT Competitiveness Index, with 40.68 points out of 100, Egypt would be ranked 15th if it were included, mainly owing to its large talent pool. . Egypt can boast the **highest number of ICT students** when compared to the emerging Europe region. At the moment, there are only 215 ICT specialists employed per 100,000 people, compared to the emerging Europe average of 1,044. That demonstrates a lot of potential for the country to complement the offering of the region especially amid the rising scarcity in Europe's ICT talent and the saturation in the region's most popular nearshore destinations. Moreover, salaries in the Egyptian sector remain competitive — in 2019, **the average salary was estimated at 454 euros**, an annual increase of about five per cent. Egypt is competitively offering services ranging from multilingual contact centers to high-value niche services such as product development and R&D.

ICT STUDENTS

314,884	99%	1%	2019*
279,996	99%	1%	2018*
269,612	99%	1%	2017*

■ bachelor and short-term
□ master's and doctoral
* estimate

ICT GRADUATES

63,842	99%	1%	2019*
59,113	99%	1%	2018*
54,660	99%	1%	2017*

■ bachelor and short-term
□ master's and doctoral
* estimate

ICT EXPORTS**

0.25%
0.26%

□ % of GDP
□ 2019
□ 2018

ICT VALUE ADDED

2.50%
2.27%

EXPORTS**

	2018	2019
ICT services (millions, euros)	637.2	728.9
of which **computer services** (millions, euros)	173.8	256.8

**SOURCE: ITC, UNCTAD, WTO based on IMF statistics for 2018 and estimated for 2019

EGYPT... A TALENT HAVEN FOR THE DIGITAL SKILLS GAP IN EUROPE

A glimpse of **Dell Technologies** Centre of Excellence in Cairo.

MAGUED MAHMOUD
VICE PRESIDENT & GENERAL MANAGER, DELL TECHNOLOGIES CENTRE OF EXCELLENCE IN EGYPT

In today's rapidly evolving digital age, leading technology companies are looking to drive innovation to develop products and solutions relevant to global markets and elevating customer expectations. To this end, companies have been investing heavily in diversifying services locations to access the skilled talent to drive and develop the innovation lifecycle.

VALUE DRIVEN BY INNOVATION AND EXCELLENCE

Dell Technologies, with its aspiration to lead with innovation, has established four Centres of Excellence (CoEs) across the globe. With Egypt supporting the business in EMEA, the CoE plays a key role in providing technical support and consulting services, while working on research and product innovation that is in line with Dell Technologies' global commitment to transform IT and help customers build their digital future. As a result, the CoE has been successful in receiving patents and is a leading provider of services across project management, logistics, content management, technical support and pre-sales and post-sales.

Operating since 2009, the CoE currently employs more than 1,000 engineers (51 per cent women), who bring their knowledge and expertise to serve markets across Europe, the Middle East, Africa, America, and Asia in over 14 languages, taking advantage of the unique opportunities Egypt offers as a leading destination for technology innovation and services. Our team is driving programmes with global impact related to quality, process improvement, Design Thinking, Lean Six Sigma, Automation, RPA and Data Analytics in emerging technologies including Cloud, AI/ML, 5G, IOT, Security and Edge Computing.

EMERGING TECHNOLOGIES AND YOUNG TALENT COMING TOGETHER TO DRIVE OUR DIGITAL FUTURE FORWARD

Egypt's shifting ICT model from traditional technologies and servicing to digital technologies and product development has helped advance the ICT business ecosystem and infrastructure.

Each year, around 50,000 IT graduates join the workforce, providing a scalable talent pool for companies to adapt to the rapidly changing technology landscape and accelerate the adoption of automation, data-driven technologies, Modern Software Development and AI. Armed with critical thinking and advanced analytics capabilities, this workforce is advocating positive change in tech business models and processes. Given Egypt's attractive wage rates, this diversified pool of tech talent competitively caters to the global demand and helps in filling the digital skills gap - European countries are struggling to fill 760,000 ICT sector jobs this year.

RESILIENT AND RISING

What further distinguishes Egypt is its resilience and stable infrastructure. From facing unstable times during the revolution, to implementing "Work from Home" solutions, Egypt CoE has been a leading example for demonstrating resilience and driving business continuity. The government's investment in continuously improving the IT infrastructure over the past decade has also been a key enabler of our success and ability to continue to serve our customers without disruption. The sector has been lauded by the International Trade Administration as a very robust and top prospect industry sector.

NEARSHORE TO EUROPE AND GATEWAY TO AFRICA AND THE MIDDLE EAST

Egypt's strategic geographical location between Europe, the Middle East, and Africa enables it to accommodate work across various time zones and regions positioning Egypt as an ideal technology hub. The cultural diversity gained from its unique location lends itself to high levels of innovation and productivity.

BOOSTING ICT SECTOR AND FOREIGN INVESTMENT

The government has been contributing to the development of the industry aiming to accommodate the adoption of third platform technologies (IOT, Big Data, Cyber Security), support training and research funding through partnerships with educational institutions and MNCs to drive innovation.

The IT Industry Development Agency (ITIDA), the executive arm of the Egyptian Ministry of CIT, has been a strategic partner to Dell Technologies and other foreign investors, providing end-to-end business support with the aim of supporting Egypt's agenda to become the digital hub of choice.
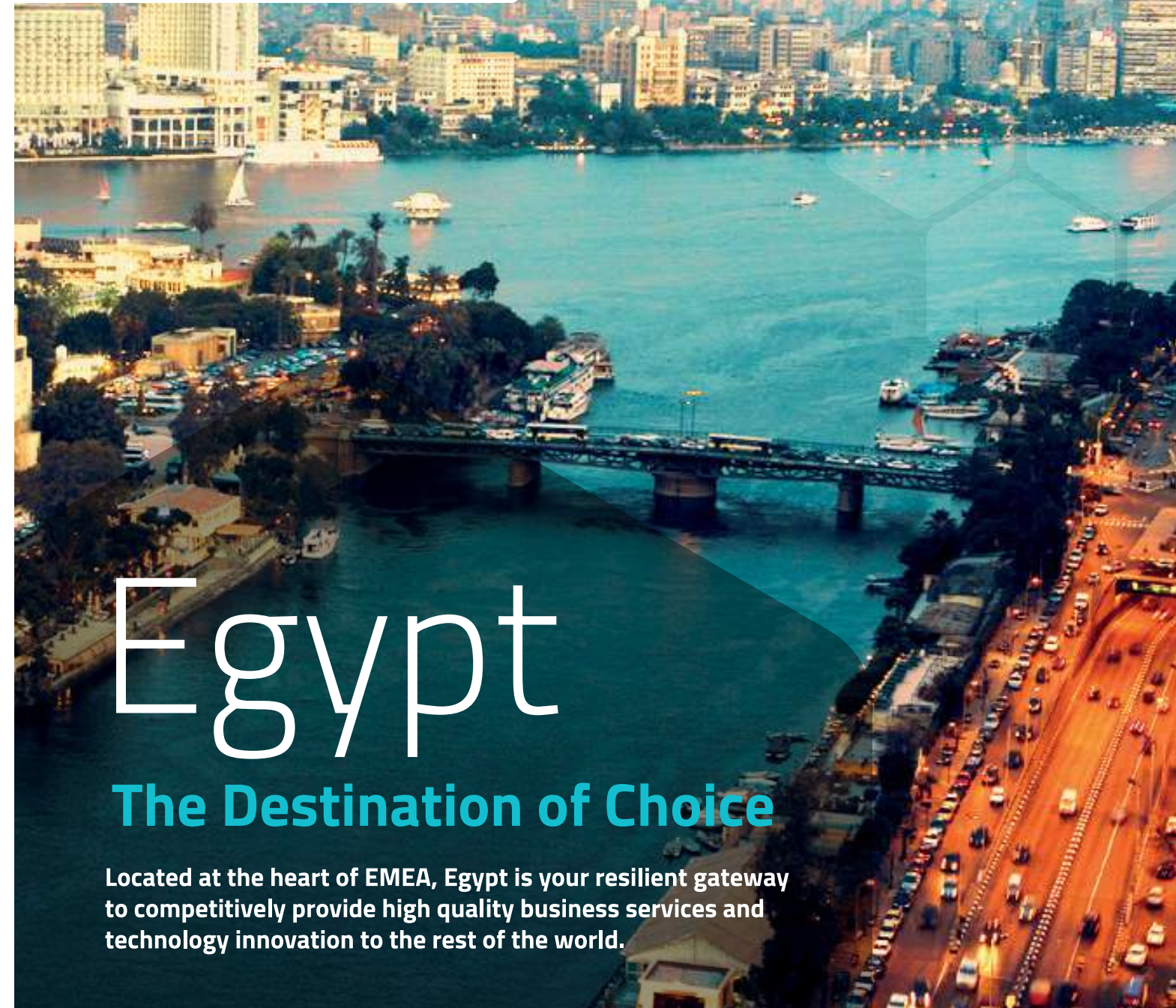
Egypt
The Destination of Choice

Located at the heart of EMEA, Egypt is your resilient gateway to competitively provide high quality business services and technology innovation to the rest of the world.
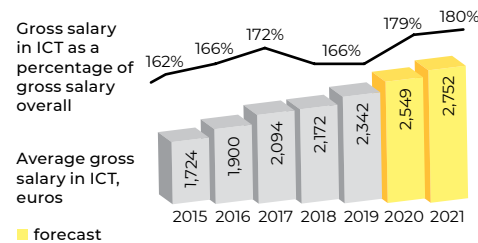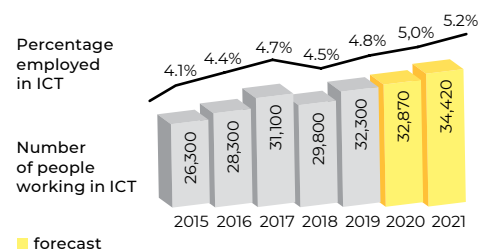
ESTONIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
1.329	702,600	28,112	21,153	292%	2,720

Estonia's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
18	10	24	8	29	25

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

162% 166% 172% 166% 179% 180%

Average gross salary in ICT, euros

1,724 1,900 2,094 2,172 2,342 2,549 2,752

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

4.1% 4.4% 4.7% 4.5% 4.8% 5,0% 5.2%

Number of people working in ICT

26,300 28,300 31,100 29,800 32,300 32,870 34,420

2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

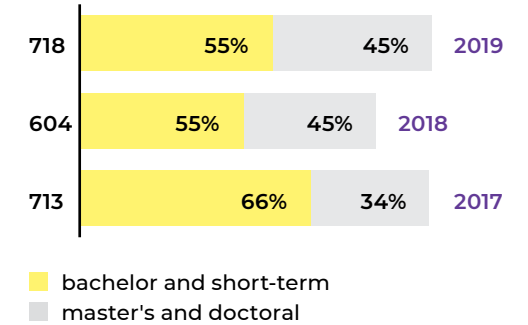| No.	Top Software Development	Top Mobile Development	Top IT Services
1	ELEKS	Softermii	ELEKS
2	4IRE LABS	Riseapps	DO OK
3	DO OK	Zoftify	Cut2Code
4	Riseapps	RedCat Ltd	4IRE LABS
5	Bamboo Agile	Sonerim	IT Svit

*SOURCE: **Clutch Leaders Matrix**

Since independence in 1991, Estonia has taken major strides to becoming one of the world's most exciting nations in the ICT sphere. The development of pioneering telecommunications service Skype in 2003 made waves throughout the digital world. Since then, Estonia has developed a deserved reputation as a hub for innovation and entrepreneurship. Now the nation boasts Europe's third-highest number of start-ups per capita, six times higher than the European average. Over 400 start-ups - including international behemoths Wise (formerly TransferWise), Bolt and, of course, Skype — were set up by Estonians. Furthermore, Estonia has the distinction of hosting four unicorns — companies that reach a valuation of over one billion dollars. This is all in a nation with a smaller population than the Bronx.

Savvy government investments and policies created the environment for ICT companies to flourish. Upon independence, Estonia's young administration banked on the fledgling internet. Declared a human right by the government as early as **1997, a stunning 97 per cent of Estonian schools had internet access**. By 2002, the state was already establishing free public wifi covering most of the country. Between 2002 and 2009, over 100,000 Estonians were trained — for free — by their government in computer literacy. Public schools teach their students coding and basic programming. Consequently, internet use skyrocketed from 28.6 per cent of the population in 2000 to **over 90 per cent as of 2020**. These investments have paid dividends — now the ICT industry employs almost five per cent of the labour force and generates almost seven per cent of the country's GDP.
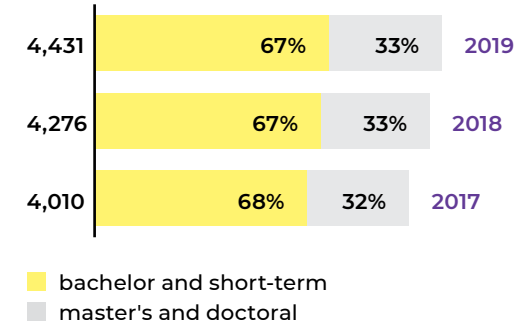
These achievements are reinforced by impressive innovations in digital identification. Most ubiquitous of these is e-Estonia, an ambitious project seeking to digitise government services. Electronic identification cards were introduced in 2002 as the first stage of this project. Since then, over 600 government functions have been made accessible to the population online. Voting, paying taxes and utilities, signing contracts, making bank transfers, applying for welfare - all of these vital functions can be done with the click of a button, hugely simplifying the processes. These innovations have reportedly saved the state two per cent of its GDP, freeing up vital resources from administrative trivialities.
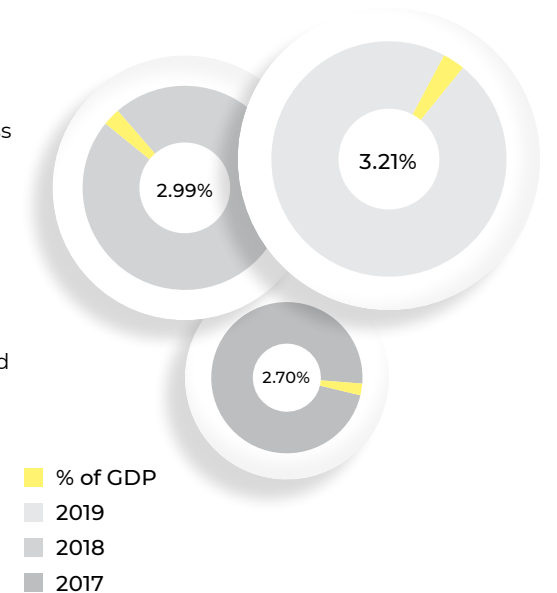
Estonia's ICT exports have been consistently rising for years, seeing a 96 per cent increase between 2015 and 2019 and coming to contribute to over three per cent of GDP. Inspired by the success of the industry, more and more students are enrolling in ICT programmes at universities and average ICT salaries have outpaced the general average in how quickly they grow. Estonia is undoubtedly one of the world's biggest ICT success stories and looks set to continue its meteoric rise.
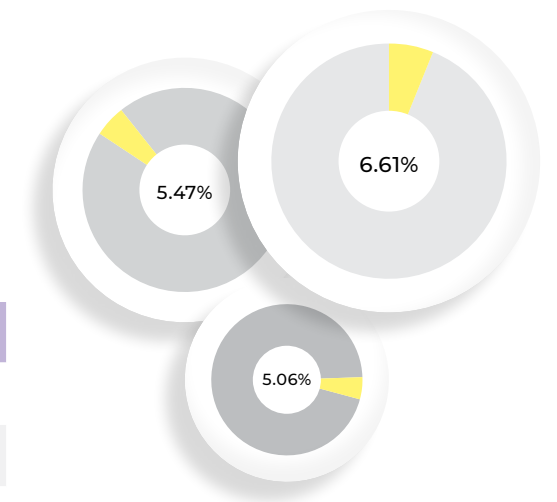
Estonia has also managed to become an attractive destination for international companies. Low and stable corporate tax rates lure start-ups seeking to minimise expenditures, while the simplicity of the registration process — conducted entirely online and lasting under 20 minutes, thanks to e-Estonia — removes so much of the hassle of international commerce. Starting in 2017, Estonia also offers a generous one and a half year-long start-up visa for non-EU nationals, allowing it a pick of the world's brightest talents, with the visa process characteristically straightforward, quick and high-tech.

In the IT Competitiveness Index, **Estonia ranks second** in emerging Europe. At **2,342 euros**, the average salary in the ICT sector is the third highest in region, after Slovenia and Czechia.

ICT STUDENTS

4,431	67%	33%	2019
4,276	67%	33%	2018
4,010	68%	32%	2017

■ bachelor and short-term
□ master's and doctoral

ICT GRADUATES

718	55%	45%	2019
604	55%	45%	2018
713	66%	34%	2017

■ bachelor and short-term
□ master's and doctoral

ICT EXPORTS

2.99% 3.21% 2.70%

■ % of GDP
□ 2019
□ 2018
□ 2017

ICT VALUE ADDED

5.47% 6.61% 5.06%

EXPORTS

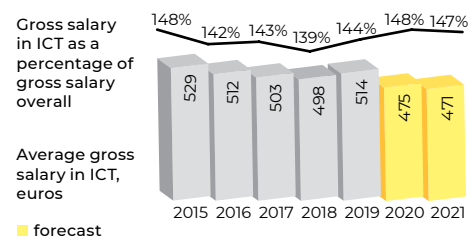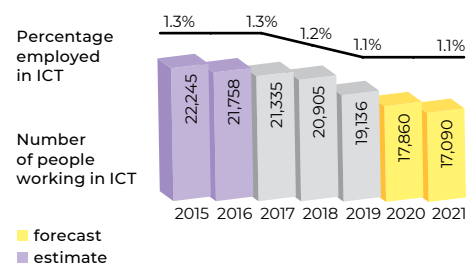|	2015	2016	2017	2018	2019
ICT services (millions, euros)	459.5	521.6	645.2	774.4	901.7
of which **computer services** (millions, euros)	266.2	331.2	462.8	563.9	678.3

GEORGIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
3.717	1,911,200	15,614	4,201	360%	1,133

Georgia's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
7	12	56	66	61	47

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

148% 142% 143% 139% 144% 148% 147%

Average gross salary in ICT, euros

529 512 503 498 514 475 471

2015 2016 2017 2018 2019 2020 2021

- forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

1.3% 1.3% 1.2% 1.1% 1.1%

Number of people working in ICT

22,245 21,758 21,335 20,905 19,136 17,860 17,090

2015 2016 2017 2018 2019 2020 2021

- forecast
- estimate

Although Georgia is a relative latecomer to the ICT industry, recent government initiatives have shown a promising commitment to developing the industry. Situated at the crossroads of Europe and Asia, Georgia has long straddled the line between competing spheres of influence. Since independence, the country has been moving in an increasingly pro-Western direction, opening itself up to outside influences and investments. This underscores Georgia's eagerness to create a similar environment for the development of ICT industries as is

seen in the West. And the relative underdevelopment of the start-up scene presents promising prospects for growth.

The internet penetration rate, although lower than most European countries, has been rapidly increasing in past decades, growing from under one per cent of the population in 2000, to **68 per cent** in 2020. According to Ookla, the average download speed of the broadband internet was 26.23 Mbps in December 2020.

According to a EU4Business report looking at the SME Development and the Deep and Comprehensive Free Trade Agreement, due to the lack of reliable statistics on the information technology subsector and the characteristically small size of many firms, it is not possible to estimate the number of firms providing products and services (e.g., software and mobile application development, electronics and hardware, software sales and integration, support, and IT services) in the market but the nascent ICT community in the country is ready to take advantage of its strengths and existing opportunities to reach EU markets.
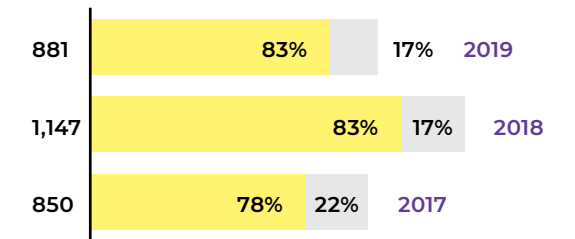
Georgia also welcomes investment in the sector. Company registration takes just a day in Georgia — in fact, it is ranked among the most business-friendly nations in the world. Georgia also operates an incredibly simplified tax regime, with just six types of
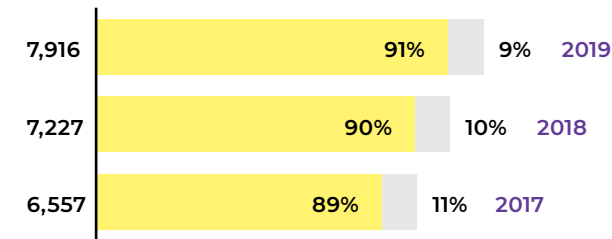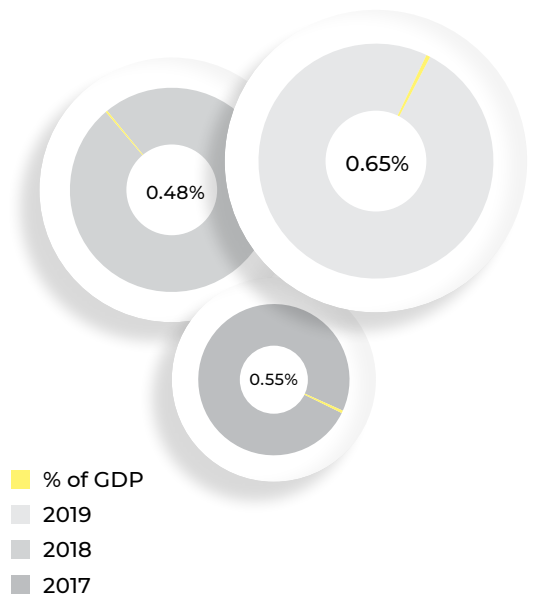
taxes. In 2020, the government announced an even bigger tax break for 'international companies', particularly in the ICT sphere: now such companies only pay **five per cent in corporate profit tax**. This initiative is undoubtedly aimed at attracting more international capital to give a boost to the country's ICT industry.

On top of the generous corporate tax breaks, the government operates a specialised agency to support its start-ups. GITA, the Georgian Innovation and Technology Agency, provides mentoring, guidance and financial support for up and coming ICT companies.

In 2015 and 2016, Georgia opened its first two technology parks, in Tbilisi and Zugdidi. In addition to this, government initiatives such as "Start-up Georgia" and "Georgia 2020" put special emphasis on the development of the ICT industry. Finally, USAID also operates a "Growth in Georgia" programme

which provides funding to innovative businesses in the country.

According to Stackoverflow data, the number of developers in Georgia was estimated to be **8,100** in 2019.

As far as the IT Competitiveness Index is concerned, **Georgia ranks 16th** across emerging Europe. Georgia is a welcoming country to do business in — it scores very highly on the economic freedom and ease of doing business indices. Although it is outperformed in sheer volume of ICT graduates by neighbouring countries, the industry is nonetheless rapidly growing and the accommodating business environment gives a strong platform for it to continue. Also, with 515 ICT specialists employed in the sector per 100,000 people, Georgia is the second lowest in the region.

On a more positive note, the country has the most competitive average salary in ICT across the emerging Europe region. It amounted to **514 euros in 2019**.

ICT STUDENTS

7,916	91%	9%	2019
7,227	90%	10%	2018
6,557	89%	11%	2017

- bachelor and short-term
- master's and doctoral

ICT GRADUATES

881	83%	17%	2019
1,147	83%	17%	2018
850	78%	22%	2017

- bachelor and short-term
- master's and doctoral

ICT EXPORTS

0.48%
0.65%
0.55%

- % of GDP
- 2019
- 2018
- 2017

ICT VALUE ADDED

2.42%
2.69%
2.46%

EXPORTS

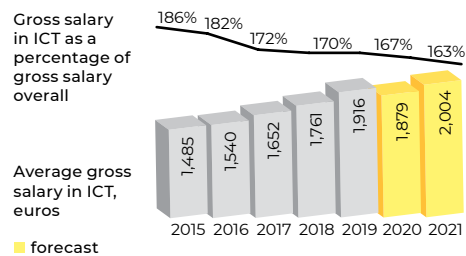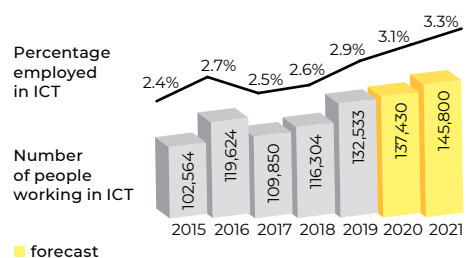|	2015	2016	2017	2018	2019
ICT services (millions, euros)	40.5	50.8	79.6	71.6	101.7
of which **computer services** (millions, euros)	4.1	6.5	35.5	36.0	55.9
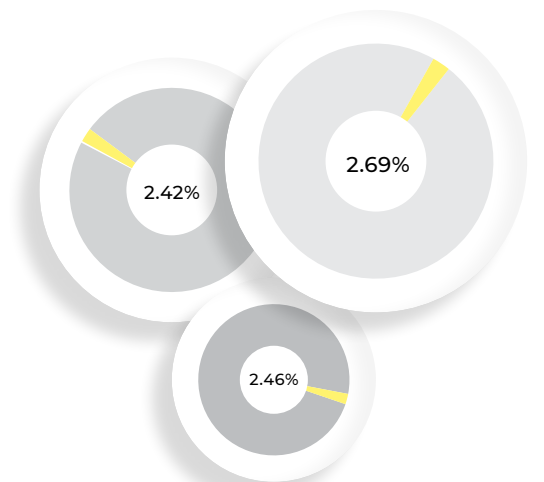
HUNGARY

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
9.773	4,671,860	146,039	14,944	178%	4,649

Hungary's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
52	62	40	36	40	14

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

186% 182% 172% 170% 167% 163%

Average gross salary in ICT, euros

1,485 1,540 1,652 1,761 1,916 1,879 2,004

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.4% 2.7% 2.5% 2.6% 2.9% 3.1% 3.3%

Number of people working in ICT

102,564 119,624 109,850 116,304 132,533 137,430 145,800

2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

No.	Top Software Development	Top Mobile Development	Top IT Services
1	Apriorit	Budacode	IncQuery Labs
2	GuideSmiths	Supercharge	Webtown
3	Integral Vision	Yomba	Exalt Interactive
4	IncQuery Labs	Mindtech Apps	Wozify
5	Webtown	Digital Natives	Hard Code

*SOURCE: Clutch Leaders Matrix

Hungary is increasingly an ICT-dominated economy, a country with a history of innovation and invention. Janos Neumann (also known as John von Neumann) was born in Hungary and went on to play a major role in the Manhattan Project. The floppy disc was also birthed in Hungary by inventor Marcell Janossi.
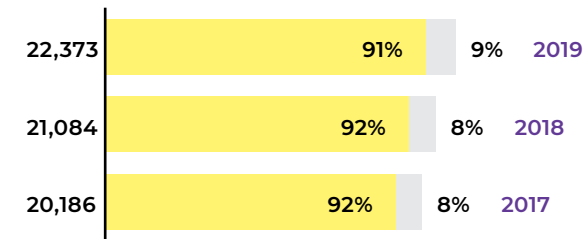
Since the fall of communism in 1989, Hungary has managed to develop rapidly, with GDP per capita rising by 75 per cent between 1996 and 2017. ICT played a big part in this: during the 2009 recession, it was the only sector in the Hungarian economy to not take a major hit.

Hungary has been an EU member since 2004, giving it unfettered access to the European market.

ICT now contributes 10 per cent of Hungary's GDP. Hungary is a regional leader in computer assembly and communications equipment manufacturing. Although standards of living are virtually on par with those in Western Europe (at least in urban areas), the costs of labour are still much cheaper.
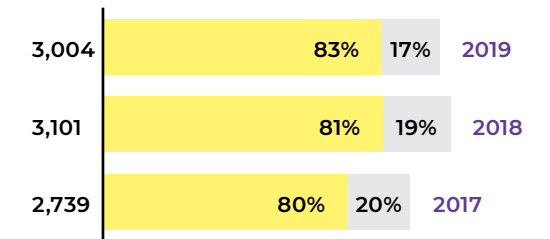
In 2006, Morgan Stanley opened an IT support centre in Budapest, offering hundreds of jobs with very high salaries. This spurred interest in working in the sphere in Hungary and Citibank followed suit. Since then, the **start-up scene has been rapidly developing**, with 2018 seeing double the number of start-up investments as the previous year. Hungary's biggest success story to date in the ICT industry is the success of presentation app Prezi, which became Hungary's first unicorn.

The European Union has also given funds to support ICT development. In 2016, eight incubators were opened with EU funding. The Budapest Enterprise Agency, a public foundation run by the Budapest city council provides financial support, workshops and training to innovative start-ups, particularly with young or female founders.

Business registration takes four to five working days in Hungary. Furthermore, ICT companies enjoy a special tax regime of nine per cent corporate tax, among the lowest in the European Union. Hungary also allows fledgling companies to only register a virtual office in lieu of a physical office. This frees up funds in the vital early stages of development. Hungary also offers residency to foreign entrepreneurs, normally lasting one or two years with the option of extension. In 2020, Hungary unveiled its ambitious **plan to develop its AI industry**, projecting that by 2030 this would account for 11-14 per cent of GDP.
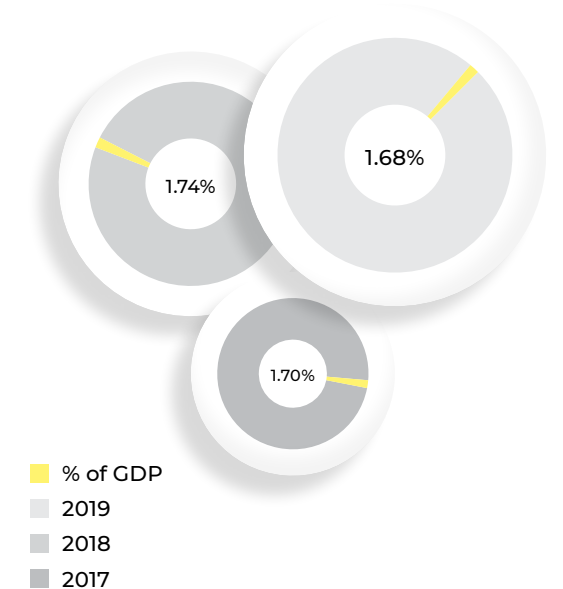
ICT STUDENTS

22,373	91%	9%	2019
21,084	92%	8%	2018
20,186	92%	8%	2017

■ bachelor and short-term
□ master's and doctoral

ICT GRADUATES

3,004	83%	17%	2019
3,101	81%	19%	2018
2,739	80%	20%	2017

■ bachelor and short-term
□ master's and doctoral

Exports of ICT services have predictably been steadily growing, increasing by 62 per cent between 2014 and 2019. However, this has not quite kept pace with general economic growth, with the proportion of ICT of the GDP fluctuating around 1.7 per cent between 2017 and 2019. ICT salaries are also steadily growing, although not as quickly as average salaries in general. While recent tensions between the government and the tech world may throw some doubts into the future of Hungary's ICT industry, the underlying statistics nevertheless remain promising.
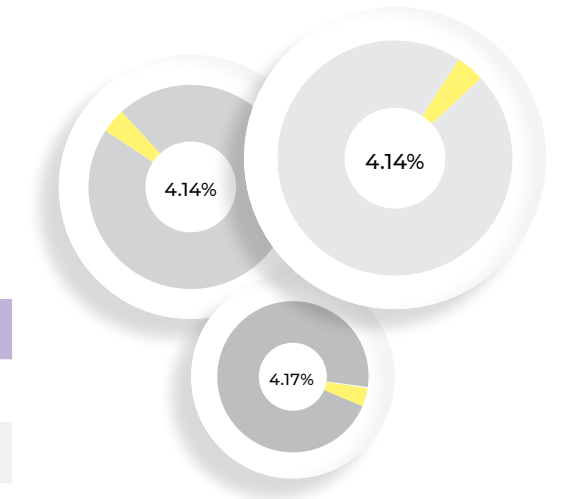
In the IT Competitive Index, **Hungary ranks fourth** across emerging Europe and **first in the talent component**. The annual growth of both students and graduates — both nominally and per 100,000 inhabitants — is the highest in the region. However, the number of ICT graduates per 100,000 people amounts to 31 and is lower the emerging Europe average of 42. However, the country can boast the second highest position in the EF English Proficiency Index, 14th globally.

ICT EXPORTS

1.74% 1.68% 1.70%

□ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

4.14% 4.14% 4.17%

EXPORTS

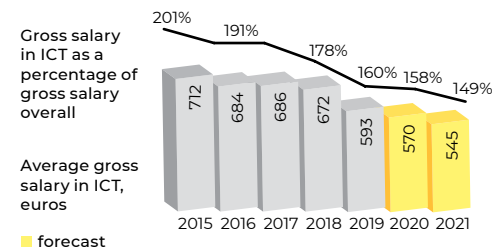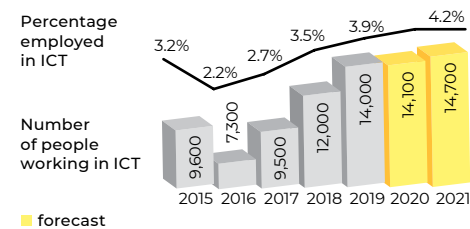|	2015	2016	2017	2018	2019
ICT services (millions, euros)	1,633.3	1,741.4	2,159.8	2,372.1	2,457.6
of which **computer services** (millions, euros)	1,477.9	1,584.7	1,856.9	2,070.2	2,197.6

KOSOVO

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
1.782	488,500	7,104	3,986	252%	266

Kosovo's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
57	53	-	75	-	-

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

201%, 191%, 178%, 160%, 158%, 149%

Average gross salary in ICT, euros

712, 684, 686, 672, 593, 570, 545

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

3.2%, 2.2%, 2.7%, 3.5%, 3.9%, 4.2%

Number of people working in ICT

9,600, 7,300, 9,500, 12,000, 14,000, 14,100, 14,700

2015 2016 2017 2018 2019 2020 2021

■ forecast

Kosovo is a country with vast growth potential, especially in the ICT industry. The second youngest country in the world, with Europe's youngest population (over 40 per cent of the population is under 25), Kosovo's government has recognised the potential ICT can have for its rapid development. Due to the circumstances of the creation of the country, a large proportion of the population is proficient in English. The official currency is euros, which greatly eases the process of conducting business with European-based partners. Furthermore, the country is heavily supported by NGOs and predominantly western governments due to its strategic value, which ensures a continued flow of aid and finance for development, as well as a guarantee of policy uniformity.
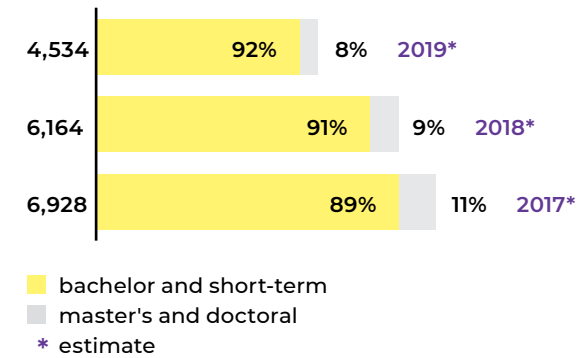
The ICT sector is one of the only sectors of Kosovo's economy which records a positive trade balance. Just over 78 per cent of ICT companies in the country export products or services and the sector represents over **22 per cent of Kosovo's service exports**. Central Europe, USA and UK have the highest potential to export to, namely Switzerland and Germany, followed by North America (the US and Canada), and United Kingdom. East Asia, and Middle East and Africa are seen with little or no potential for export.

This makes the ICT sector a reliable source of much-needed income in the fledgling country. The government has recognised this potential and even operates a specific ministry of innovation, which has the improvement of the country's ICT infrastructure as a major goal. A low, **flat corporate tax rate of 10 per cent encourages business activity** in the country.
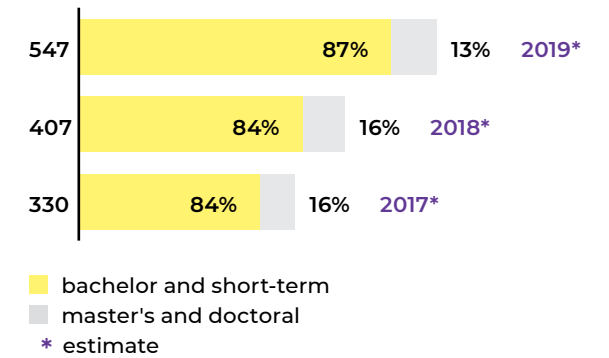
The most popular local horizontal markets are document management, followed by data warehousing, business process optimisation, e-commerce and product maintenance, support and customization.

There is a wealth of non-governmental organisations and institutions which are either dedicated to developing the ICT industry, or have projects and initiatives with this goal. The biggest of these is the Kosovo ICT Association (STIKK), which was established shortly after independence. This institution helped establish the first tech park in the country, in the capital of Prishtina. STIKK also operates the Innovation Centre Kosovo, the biggest integrator for start-ups in Kosovo. UNICEF also has a programme called Innovations Lab, where they fund innovative and sustainable business plans created by Kosovo's youth.
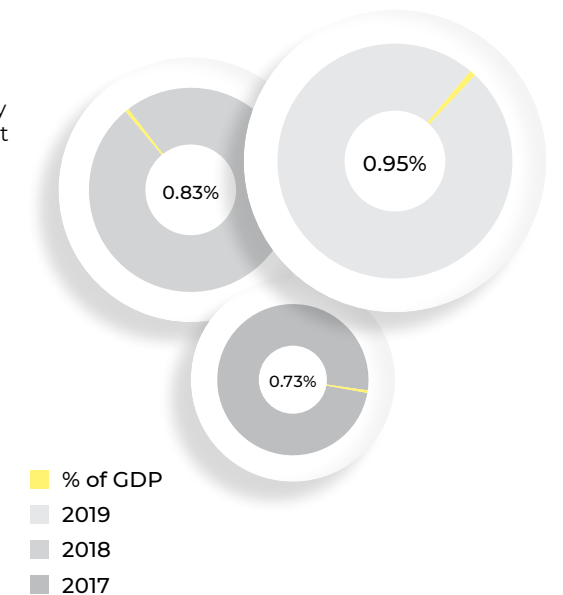
Reflecting the successful status of the ICT industry in Kosovo, the percentage of ICT students and graduates in Kosovo has been steadily increasing, along with the proportion of ICT workers in the workforce. Now there are 13 higher education institutions, some subsidised from abroad, which offer ICT classes. However, despite the efforts of civil society and western governments, Kosovo still has many issues to surmount. Unemployment remains high at nearly 30 per cent.

Average salaries in ICT have also decreased from the early 2010s, while average salaries in other sectors have slowly and steadily increased. At the same time, the value of computer services exports rose from 8.8 million euros in 2014 to 33.9 million euros in 2019.

Kosovo is ranked 18th in the IT Competitiveness Index. Kosovo has highly competitive average ICT salary, amounting to **593 euros in 2019**, which is the third lowest figure in the region. Furthermore, the number of ICT specialists per 100,000 people has been rising at a double-digit rate over the last three years. There is a room for improvement in mathematics proficiency, as Kosovo is ranked lower than other countries in the region in the PISA Mathematics ranking and International Mathematical Olympiad.

ICT STUDENTS

4,534	92%	8%	2019*
6,164	91%	9%	2018*
6,928	89%	11%	2017*

■ bachelor and short-term
□ master's and doctoral
* estimate

ICT GRADUATES

547	87%	13%	2019*
407	84%	16%	2018*
330	84%	16%	2017*

■ bachelor and short-term
□ master's and doctoral
* estimate

ICT EXPORTS

0.83%, 0.95%, 0.73%

% of GDP
2019
2018
2017

ICT VALUE ADDED

1.86%, 1.75%, 1.81%

EXPORTS

	2015	2016	2017	2018	2019
ICT services (millions, euros)	54.8	48.4	46.6	55.8	67.2
of which **computer services** (millions, euros)	14.3	13.1	15.4	21.4	33.9
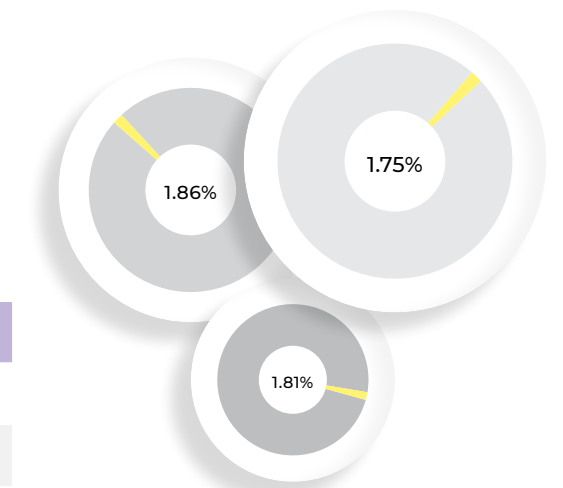
KOSOVO'S IT SECTOR
The hidden diamond

Raiffeisen Bank International's competence centre for strategic initiatives proves that while Kosovo may be small, its IT sector has big potential.

Back in 2012, Raiffeisen Bank International's (RBI) branch in Kosovo needed a mechanism to centralise and tailor its services. Six years later, the IT competence centre for strategic initiatives (CCSI) has proven itself to be a diamond in the rough, offering the banking group a talented workforce and smart solutions.

Now, as the CCSI's manager Kreshnik Halili tells *Emerging Europe*, it supplies RBI group with a streamlined approach to data warehouse, digital technologies, governance risk, and compliance solutions.

This success goes to show that Kosovo, despite its size, should not be overlooked for its skill in the IT sector. As the maxim goes, 'quality over quantity.'

Prior to the establishment of CCSI, RBI was looking for ways in which it would foster competences from its network units for the development and enhancement of their IT services. After extensive planning with the local COO Shukri Mustafa, and along with the support of RBI and local management, the decision was made to prepare a proposal for a competence centre exclusively dedicated to RBI's services.

PHOTO: KRESHNIK HALILI, HEAD OF THE COMPETENCE CENTRE AND STRATEGIC INITIATIVES, RAIFFEISEN BANK KOSOVO

BEYOND STREAMLINING

The primary aim was to ensure a more efficient, structured and tailored approach to service delivery for the bank. However, as Mr Halili explains, this allowed for the CCSI to go beyond streamlining, and provide the right ecosystem and resources for growth, where strong foundational knowledge in IT met disruptive thinking, ensuring smart strategic solutions to services beyond the conventional.

When starting out, the team of just three found it difficult to gain the trust of the group head office to delegate their operations to the centre.

"It was very challenging at the beginning," explains Mr Halili. "It is not by default that you would expect IT services from Kosovo."

However, after proving their talent with the first few projects - such as delivery of a GRC platform to the group's security department - they quickly moved on to bigger competences and the RBI group came to realise the CCSI's true potential.

"After the first project, RBI HO and some sister banks wanted to open-up and try new projects, up to the point that we have now become one of the preferred partners for delivering group solutions," says Mr Halili.

EVOLUTION

Now, the CCSI team stands at 41 employees and growing, an evolution done in sync with the group head office. And it is this group of employees that appears to have consistently been the centre's point of difference.

"I went to RBKO CCSI with tight deadlines and high expectations, asking them if they will build for us nothing less than a customer centric lending platform," says Vasilica-Valentin Pantazi, international leasing steering and product management at RBI. "Yes, I was impressed with their technology stack, with their agile delivery methods, but what made me tilt the balance and decide to go for their services was the team."

Many at RBI value the CCSI because of its innovative mentality. Finding a group of individuals with IT skills may prove easy, but finding individuals who can then apply this knowledge to complex problems, initiative and thinking outside the box proves moves difficult. Yet, this is exactly what the centre has been able to achieve.

According to the centre's manager, this is partly down to nature of the IT sector in Kosovo.

"When it comes to IT in Kosovo, I compare our IT talents to diamonds. Diamonds are made under pressure and usually are found in uncharted territory," Mr Halili explains. "It's the same here, despite a challenging environment in Kosovo, our IT talents have proven that they are very competitive with their know-how."

"Kosovo is not on the top lists of IT sourcing destinations, that's why I say it is uncharted, but for Raiffeisen and some other companies to enter this uncharted territory proved to be very rewarding."

AN UNCONVENTIONAL CHOICE

Of course, growing up in a country that has been unrecognised by many international players, and suffered economic and political upheaval significantly inhibits access to opportunity, and makes it an unconventional choice for IT focus.

Yet paradoxically, this hardship is fostering Kosovo's unique talent, partly stemming from young Kosovans' ambition and the need to prove themselves above and beyond expectations.

Universities in the country like the University for Business and Technology (UBT), the Innovation Centre Kosovo (ICK), and two sponsored IT labs, one at UBT and once at Cacttus Education, as well as an Elevator Lab Fintech Partnership programme - sponsored by the bank – are aiming to foster this talent pool.

While earlier this year a PwC report found that formal and vocational IT education in Kosovo is below the needs of some companies, these institutions are seeking to change this and break expectations.

As the ICK's director, Uranik Begu explains, fostering this ambition for learning, particularly in sales and marketing, is key to the sector's longevity and to overcome regional competition.

"Given the untapped potential of our youth, this centre [ICK] has become a home to many young people who see it as an opportunity to develop their ideas into sustainable businesses. Basically, they come to us with an idea, and we offer them tailored services and programs to help them accelerate their businesses," he says.

A DYNAMIC, SHIFTING SECTOR

Moreover, the sector is dynamic and always shifting, so staying in close contact with the stream of talent coming out of these institutions is paramount. A close connection with universities and programmes therefore aims to ensure a sustainable talent pool in Kosovo.

However, for Mr Halili, while a good education in IT is important, it is not the be all and end all. Rather, what he looks for is attitude. An ambitious, competitive talent, willing to go the extra mile is what lies at the heart of the recruitment process. This cannot be taught, whereas skills can be.

It is these core attributes which Kosovo's unique environment offers, and one which the CCSI encourages.

"If the proprietary technologies are there, with attitude and basic logical knowhow, then we will help with processes and learning, allowing them to grow with us," explains Mr Halili. "Hands on training, online training, coaching with senior developers, that is what is most important. We offer a lot of freedom, a lot of labs. This allows talent to experiment, learn to break things and truly learn to think outside of the box."

Fostering this agile environment has paid off for the centre. As RBI's Martin Köb from group information and cybersecurity explains, "colleagues are always coming up with solutions, I haven't heard once that 'this is not possible'."

AN IMPORTANT EXPORTER

More broadly, Kosovo's IT sector must still counteract the struggles of a younger industry, where many stakeholders lack in-depth knowledge and resources, and more efforts are needed to establish a strong institutional framework, including relationships regarding markets and trends. However, projects like the CCSI are beginning to shift this climate towards becoming stronger and more established.

The PwC report also found that the rate of start-up failure in Kosovo remains high, with around two-thirds requiring more financial support, which Covid-19 will accentuate. Nevertheless, the same report found that "the ICT sector is among the few sectors within the Kosovo economy that is characterised by a positive trade balance," where around 78 per cent of already existing companies export their services.

The government is further trying to aid the development of the country as a hotspot, building upon strong IT and language skills. This spells good news for Kosovan IT, where the success of the CCSI may be just the beginning, if financial constraints can be overcome.

Kosovo's very young population, and its increasing focus on the IT sector means that this trend of innovative thinking is likely to continue. With almost every young person fluent in English, and many becoming fluent in German, as more German companies are entering the market, it appears as though young Kosovans have indeed proven their worth as diamonds in the rough.
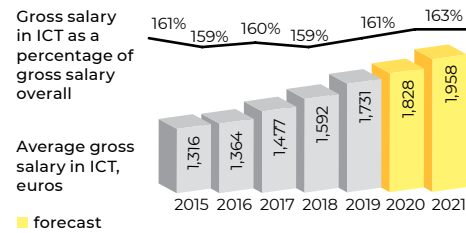
LATVIA

OVERVIEW

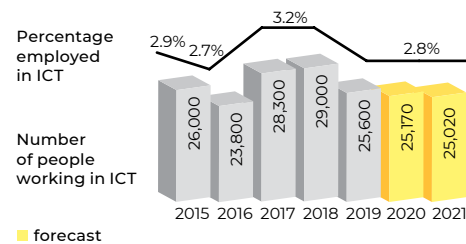| Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
1.908	971,300	30,463	15,969	224%	705

Latvia's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
19	32	35	24	37	29

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall
161% 159% 160% 159% 161% 163%

Average gross salary in ICT, euros
1,316 1,364 1,477 1,592 1,731 1,828 1,958
2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT
2.9% 2.7% 3.2% 2.8%

Number of people working in ICT
26,000 23,800 28,300 29,000 25,600 25,170 25,020
2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

No.	Top Software Development	Top Mobile Development	Top IT Services
1	Chili Labs	DIGIS	Advascale
2	Diatom Enterprises	Chili Labs	Arkbauer
3	Intechnic	Mediapark	Telia Latvija
4	Arkbauer	Diatom Enterprises	Autentica
5	UNECOS SOLUTIONS	DEGO	VerticHost

*SOURCE: **Clutch Leaders Matrix**

Latvia is another nation which has taken big strides since independence, particularly in the ICT industry. With some of the fastest Internet in the world (ranked 10th globally as of 2019), near-universal wi-fi in the capital of Riga, and 84 per cent of the population using the Internet daily, Latvia has all the vital infrastructure for the ICT industry to flourish.

State and private sector initiatives provide funding, guidance and infrastructure for up and coming companies, while business-friendly legislation has been passed, underscoring the government's commitment to innovation and prosperity. Furthermore, Latvia has the lowest costs of living in the Baltics, giving it an edge over its neighbours.

While not quite as pioneering as its northern counterpart Estonia, Latvia has managed to catch up in many ways. Following the global economic recession of 2008, the Latvian government decided to bank on the growing ICT industry and start-up scene. Since 2011, the number of ICT companies more than doubled, illustrating this initiative. Now, over **400 start-ups** operate in the small nation, primarily engaged in fintech, deep tech and SaaS. Latvia also hosts several annual meetups, hackathons and tech conferences, such as Tech Chill.

A member of the EU since 2004 and the eurozone since 2014, Latvia also has the added advantage of having a cosmopolitan, multilingual workforce: the bulk of Latvia's tech professionals speak, at the very least, English, Latvian and Russian.
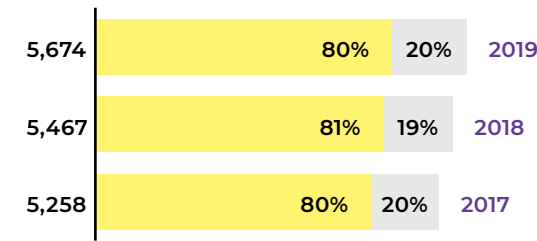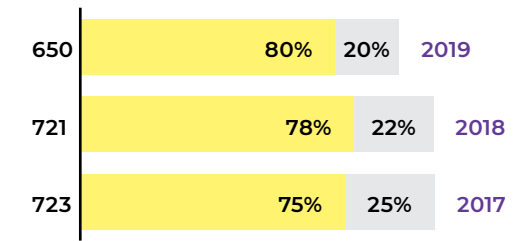
The government, working hand-in-hand with the private sector, has been active in providing a fertile environment for the ICT industry to grow in Latvia. Virtually every university has a start-up centre and a sizeable proportion of first-year students study IT-related subjects. The Investment and Development Agency of Latvia, a state organ, runs **15 'incubators'** in the country. These are institutions which provide funding, mentoring, guidance and facilities for new companies, all for free. In 2017, this programme was bolstered by a **15 million euros acceleration fund** for early-stage start-ups.

Latvia also offers a start-up visa for non-EU ICT professionals. Up to five start-up founders can get this three-year visa at once, giving a unique opportunity for international ICT talent to showcase their skills in an EU nation. Although the process isn't quite as straightforward, lighting-quick and high-tech 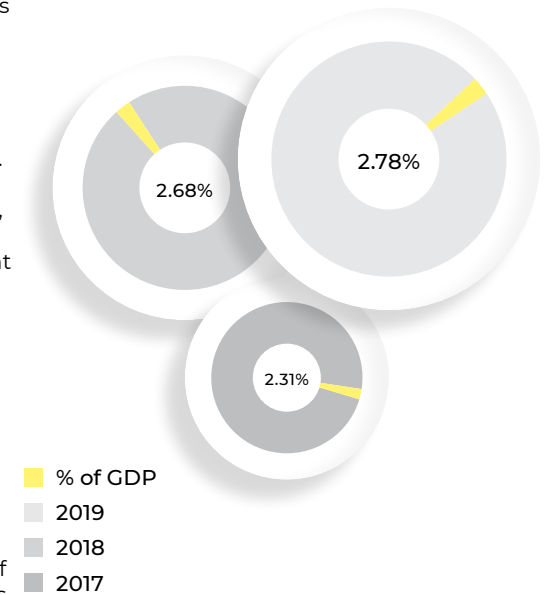as in Estonia, it is six times cheaper. Such policies, alongside the government's ambitious initiatives will give Latvia a solid platform to further develop its ICT industry.

As ICT is one of the fastest growing industries in Latvia it also attracts talent from other countries. **1,121 work permits** were issued to foreign IT professionals in 2019. Also, 20 per cent of students enrolled in ICT studies are women, who account for 27 per cent of all graduates. **11 per cent of all first-year students choose to study ICT**, 63 per cent of those are in computer sciences.
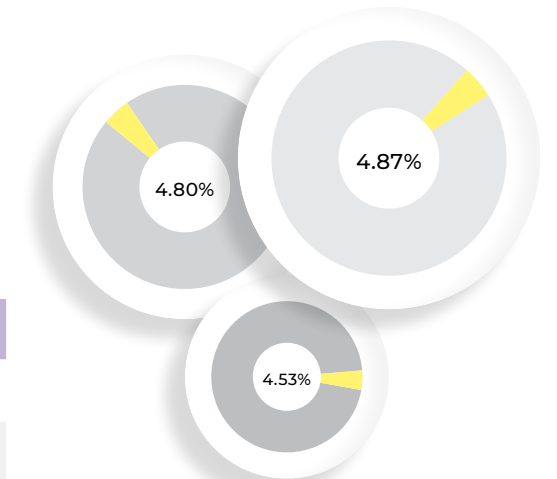
In general, the ICT sector contributes to technological progress, output and productivity growth. The industry has shown 30 per cent profit growth year-on-year. **Latvia is ranked eighth** in the IT Competitiveness Index. The country offers higher ICT salaries than both of its neighbours. With 297 ICT students per 100,000 people, the country is ranked significantly higher than the regional average (200). At the same time, Latvia scores lowest in the Baltics in the human development, social progress and economic freedom indices.

ICT STUDENTS

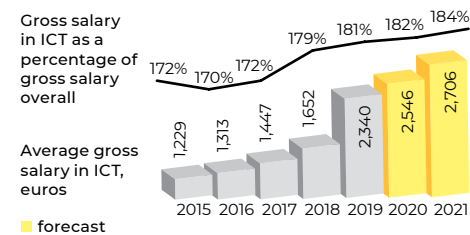|			
5,674	80%	20%	2019
5,467	81%	19%	2018
5,258	80%	20%	2017

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

650	80%	20%	2019
721	78%	22%	2018
723	75%	25%	2017

■ bachelor and short-term
■ master's and doctoral

ICT EXPORTS

2.68%
2.78%
2.31%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

4.80%
4.87%
4.53%

EXPORTS

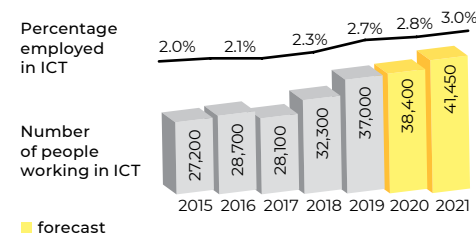|	2015	2016	2017	2018	2019
ICT services (millions, euros)	360.0	532.0	624.0	780.0	846.0
of which **computer services** (millions, euros)	235.0	298.0	386.0	442.0	499.0

LITHUANIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
2.794	1,470,400	48,797	17,465	263%	871

Lithuania's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
11	16	32	35	34	24

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

172% 170% 172% 179% 181% 182% 184%

Average gross salary in ICT, euros

1,229 1,313 1,447 1,652 2,340 2,546 2,706

2015 2016 2017 2018 2019 2020 2021

□ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.0% 2.1% 2.3% 2.7% 2.8% 3.0%

Number of people working in ICT

27,200 28,700 28,100 32,300 37,000 38,400 41,450

2015 2016 2017 2018 2019 2020 2021

□ forecast

CLUTCH TOP PROVIDERS*

No.	Top Software Development	Top Mobile Development	Top IT Services
1	TeleSoftas	Sonder Digital	Zenitech
2	NFQ Technologies	Exadel	Inkodus, UAB
3	Exadel	Melior Games	IT Respublica
4	Baltic Amadeus	Mediapark	Beyond Analysis
5	Xplicity	Scale3C	Exadel

*SOURCE: **Clutch Leaders Matrix**

The largest and most populous of the Baltic states, Lithuania is another potential power in the ICT industry. This sphere has undergone rapid growth over the past decade, thanks largely to a government initiative inspired by the success of nearby Estonia.

Now, Lithuania already has the most start-ups in the Baltics: **1,021 operated in the nation as of 2020**, even more than in Estonia, home of Skype and Bolt. In fact, 13 out of the 20 largest ICT companies in the Baltics are based in Lithuania. In 2019, the nation hailed its first unicorn: secondhand clothes selling app, Vinted. This is hoped to be a major milestone in the development of the country's ICT industry.

As with the other Baltic nations, Lithuania's government has taken initiatives to make the country amenable to business. This included removing bureaucratic barriers and simplifying tax and registration procedures. Now, it takes just three days to register a company in Lithuania.

Such policies have fueled the rapid growth of the ICT sector: Lithuania scores 9/10 on the Funding Growth Index, indicating a very high level of growth for early-stage start-ups. The country has also acquired a reputation as a hub for innovative fintech companies, ranking fourth in the world in global fintech rankings. The Bank of Lithuania supports start-ups in fintech by offering access to a regulatory sandbox, allowing companies access to 34 different countries. Now, in Europe, Lithuania is second only to the UK in the number of electronic money institutions.
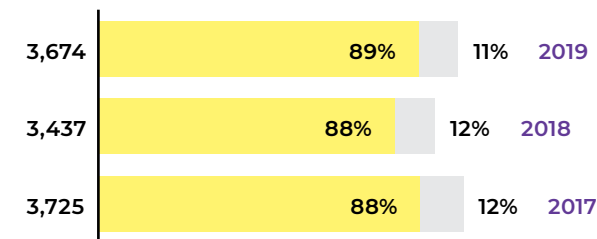
According to the International Telecommunications Union's Global Cybersecurity Index published in 2018, **Lithuania is ranked fourth globally** and second in the EU, scoring highest ratings in legal, technical, organisational and cooperation domains.
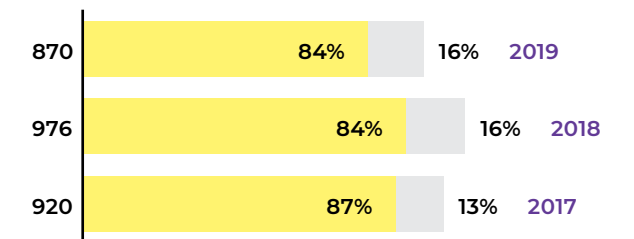
Starting in 2017, Lithuania joined the ranks of countries offering start-up visas, allowing it to compete in attracting international ICT talent. The visa offers a one-year residency with the possibility of a further year's extension. On top of this, the government also offers **a weeklong 'workation' visa**, where prospectors can get a taste of the country's start-up ecosystem. Such programmes indicate Lithuania's commitment to expanding its ICT industry, and with a streamlined bureaucratic process and high-tech infrastructure, the country looks set to continue its recent progress in the sector.

With the largest population in the Baltics, Lithuania predictably has the largest number of people employed in the ICT industry in the region. Meanwhile, according to data for 2019, some 20,500 Lithuanians returned to the country from abroad. The Covid-19 pandemic is likely to have boosted those numbers further, a positive sign as over the last 30 years the country's population has fallen by almost 700,000.

ICT exports have more than tripled from 214 million euros in 2014 to 680 million in 2019. Lithuania generates more value added in the ICT sector than Latvia. However, it lags behind its neighbours in the PISA Mathematics index.
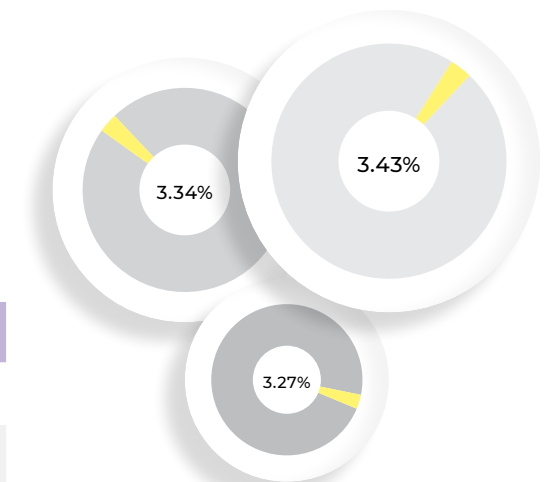
Lithuania ranks 10th in the IT Competitiveness Index. The number of ICT specialists per 100,000 people is growing faster than in the neighbouring countries, amounting to 9.1 per cent in average from 2015 to 2019. However, the country has lower number of ICT students and graduates per 100,000 people than the regional average, which may affect the future state of ICT employment.

ICT STUDENTS

3,674	89%	11%	2019
3,437	88%	12%	2018
3,725	88%	12%	2017

□ bachelor and short-term
□ master's and doctoral

ICT GRADUATES

870	84%	16%	2019
976	84%	16%	2018
920	87%	13%	2017

□ bachelor and short-term
□ master's and doctoral

ICT EXPORTS

1.22% 1.39% 1.16%

□ % of GDP
□ 2019
□ 2018
□ 2017

ICT VALUE ADDED

3.34% 3.43% 3.27%

EXPORTS

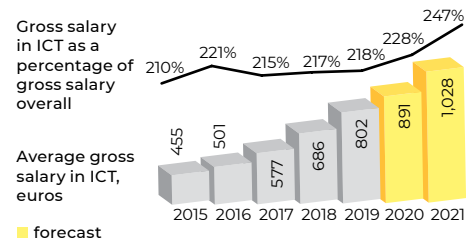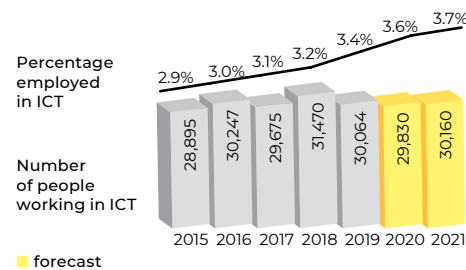|	2015	2016	2017	2018	2019
ICT services (millions, euros)	240.8	299.1	489.5	555.5	679.8
of which **computer services** (millions, euros)	159.0	234.8	373.3	455.3	575.2
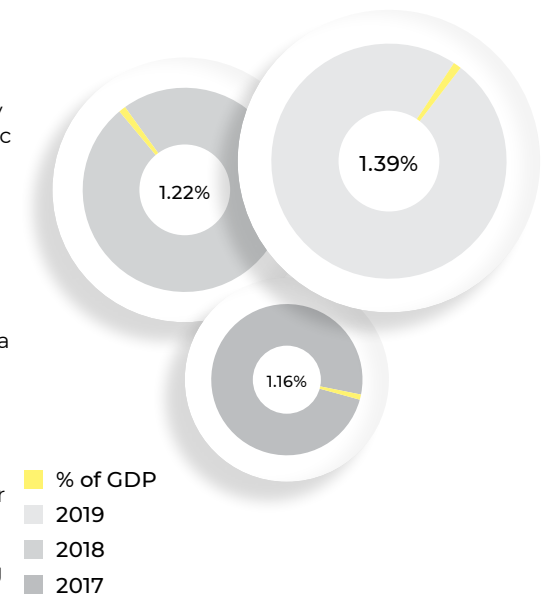
MOLDOVA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
2.640	919,300	10,693	4,050	302%	526

Moldova's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
48	87	68	55	90	-

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

210% 221% 215% 217% 218% 228% 247%

Average gross salary in ICT, euros

455 501 577 686 802 891 1,028

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.9% 3.0% 3.1% 3.2% 3.4% 3.6% 3.7%

Number of people working in ICT

28,895 30,247 29,675 31,470 30,064 29,830 30,160

2015 2016 2017 2018 2019 2020 2021

■ forecast

Moldova is in the middle of an ICT boom. According to former prime minister Ion Chicu, between 2017 and 2020, the turnover in the ICT industry multiplied by two and a half times. This is a far cry from the beginning of the millennium, when just over one per cent of the population had internet access. Now Moldova has an internet penetration rate of 76 per cent and some of the cheapest high-speed internet costs in the world, averaging just under 10 dollars a month. This growth has been fuelled by government reforms in corporate laws, alongside initiatives to make the country's ICT companies more competitive.
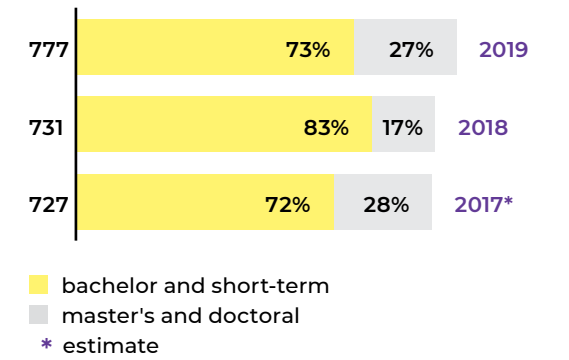
In 2016, the Moldovan government took an important step in the development of its ICT industry. It relaxed previously stringent bureaucratic regulations around business, particularly for tech companies. Now, Moldova has seven 'free economic zones' in which companies can operate under certain privileges. The country also inaugurated a **"virtual IT park"**, essentially a virtual network which start-ups can register for. Companies registered with this institution can enjoy a lowered tax rate of just seven per cent, as well as access to funding, partnerships and the international market.

The operational period of the IT park law is 10 years and the list of eligible activities is extensive, including software development and IT consulting and services, as well as R&D and educational programmes in a wide range of sectors.
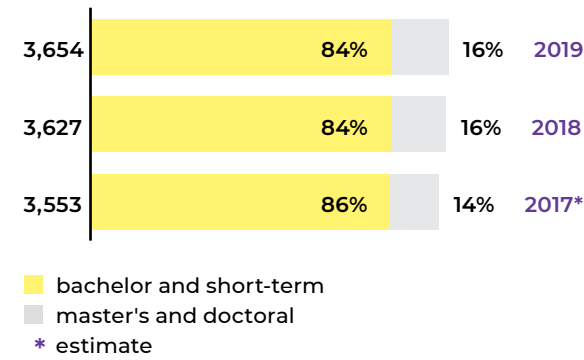
Furthermore, companies within the virtual IT park also have the privilege of being able to sponsor foreigners for IT visas, which can run for up to four years with the possibility of extension. This follows in other countries' footsteps and allows Moldova to attract international ICT talent.

Moldova also has the distinction of being one of the few countries in the world to have free trade agreements with both the European Union and the Commonwealth of Independent States. This gives the country access to vast markets in diverse countries, presenting an enticing opportunity for growth. As a result, Moldova's ICT industry is heavily export-oriented: **80 per cent of ICT products in the country are designated for the export market**, with two-thirds of this going to Western Europe and the United States.
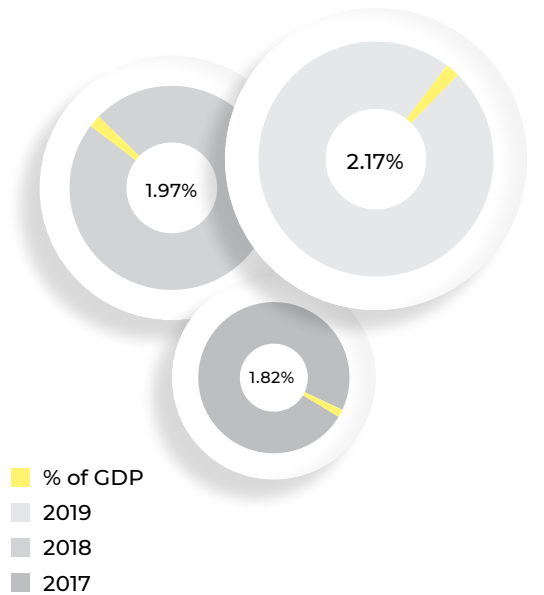
The cost of doing IT business is advantageous – **about 30 per cent to 40 per cent cheaper than its larger neighbours Romania and Russia**. Moreover, the country is recognised as a benchmark for its advancements and innovative developments in e-Government, especially by countries in East and West Africa.
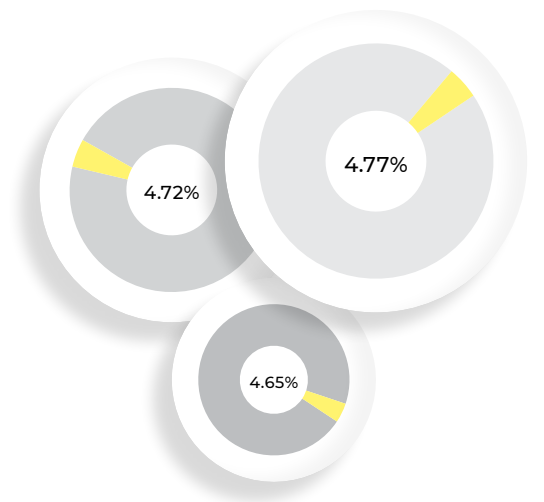
Despite the recent progress, Moldova's ICT industry still lags behind much of Europe in most metrics. Much of the country's most talented workers end up seeking greener pastures abroad, contributing to a three decade-long population decline. Although compared to other European countries with similar economic conditions, Moldova has a high number of ICT specialists per capita, and a solid seven per cent increase in export revenues over a five year span, the country still has some obstacles to overcome before it can realise its potential in the ICT sphere.

Moldova ranks 23rd in the IT Competitiveness Index. At 802 euros, the country has highly competitive salaries in the ICT sector, which are nonetheless significantly higher than the average for the countries of the region with a GDP of less than 5,000 euros per capita. The number of ICT students and graduates per 100,000 people is significantly lower than the regional average.

ICT STUDENTS

	bachelor and short-term	master's and doctoral	
3,654	84%	16%	2019
3,627	84%	16%	2018
3,553	86%	14%	2017*

■ bachelor and short-term
■ master's and doctoral
* estimate

ICT GRADUATES

	bachelor and short-term	master's and doctoral	
777	73%	27%	2019
731	83%	17%	2018
727	72%	28%	2017*

■ bachelor and short-term
■ master's and doctoral
* estimate

ICT EXPORTS

1.97%
2.17%
1.82%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

4.72%
4.77%
4.65%

EXPORTS

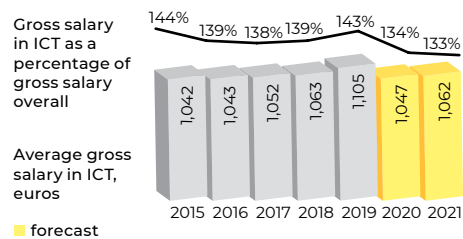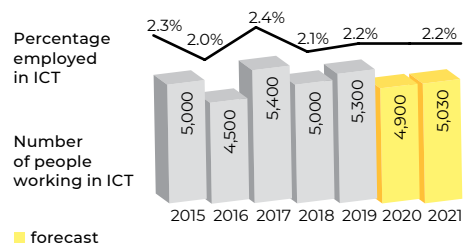|	2015	2016	2017	2018	2019
ICT services (millions, euros)	145.9	139.9	155.9	190.7	231.7
of which computer services (millions, euros)	53.1	59.9	90.8	130.8	180.7

MONTENEGRO

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
0.622	287,300	4,951	7,961	297%	404

Montenegro's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
50	91	58	53	48	-

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall: 144%, 139%, 138%, 139%, 143%, 134%, 133%

Average gross salary in ICT, euros: 1,042 / 1,043 / 1,052 / 1,063 / 1,105 / 1,047 / 1,062

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT: 2.3%, 2.0%, 2.4%, 2.1%, 2.2%, 2.2%

Number of people working in ICT: 5,000 / 4,500 / 5,400 / 5,000 / 5,300 / 4,900 / 5,030

2015 2016 2017 2018 2019 2020 2021

■ forecast

One of Europe's youngest countries, Montenegro has taken steps to establishing a strong ICT industry, although it is still in the very early stages. Since independence in 2006, Montenegro has been moving towards closer ties to the western world, and is in the process of applying for European Union membership. It was accepted into NATO in 2017, taking a big step towards strengthening ties with the West.

Montenegro's main limitation is its tiny population — it is the smallest country covered as part of this series. Five faculties teach ICT subjects, a significant number in such a small country. Now, **some 400 ICT companies** operate in Montenegro, primarily engaged in software development. Since accession to NATO in 2017, Montenegro has also greatly strengthened its cybersecurity capabilities. International heavyweights like Microsoft, Telenor and Deutsche Telekom all have offices and research centres in the country. In 2018, plans were unveiled to construct Podgorica Technological Park, following the example of similar institutions in other countries. Set to be opened in 2021, this will undoubtedly provide a boost for start-ups and ICT companies.
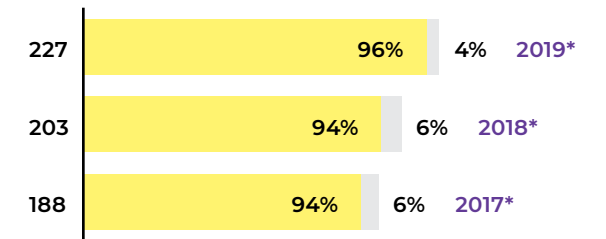
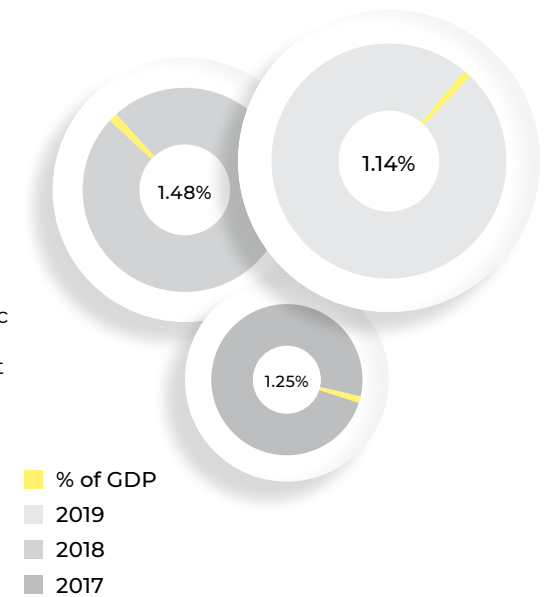Montenegro is known to have an entrepreneurially-minded population, ranking 2nd in aspiring entrepreneurs, according to RS Components. Local start-ups like Amplitudo hold start-up training programmes for elementary school children, preparing a new generation of ICT specialists. The same company also founded Digital Den, the first incubator in Montenegro. Another private initiative, the Montenegrin Business Angels Network (MBAN) has trained 3,500 civil servants, including in ICT skills.
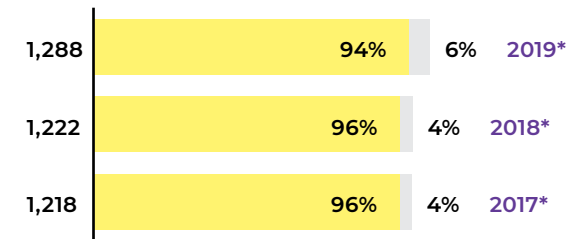
Montenegro is still finding its feet in the ICT industry. Because of this, ICT exports in 2019 still represented only 1.14 per cent of GDP, down from 1.64 per cent in 2015. The sheer volume of ICT exports has also slightly regressed in this time period. Even relative to its size, Montenegro still has few ICT specialists and its **internet penetration rate of just under 74 per cent** is lower than the European average. Average salaries in ICT have also risen by only eight per cent between 2014 and 2019, although this is at a higher rate than the general average salary. However, Montenegro should get a tangible boost to its ICT industry with the opening of the **Podgorica Technological Park**. With savvy policies, it can subsequently see quick development in the industry.
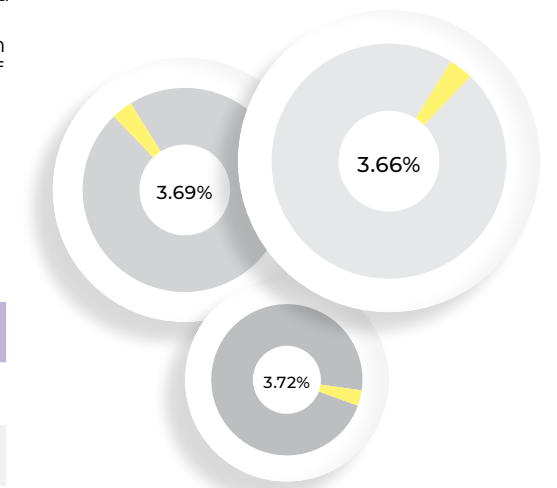
Montenegro's strategic goals in the field of ICT are identical to those defined by the Digital Agenda 2020 for Europe and the vision of the Gigabit Society until 2025. Montenegro has fully harmonised its regulations with the regulatory framework of the European Union and the EU's policies and regulatory solutions, which has provided investors with a stable investment environment. Creating conditions for the dynamic development of new generation networks; continuous improvement of e-services; and wide application of ICT in the work of public administration, economic activities and society as a whole, are the medium-term programme goals of the government.

Montenegro is ranked 19th in the IT Competitiveness Index. The average salary in ICT is fairly competitive. At **1,105 euros**, it is lower than the regional average and similar to that in North Macedonia, while annual growth is smaller than in North Macedonia. The number of ICT graduates per 100,000 people (37) is lower than the Western Balkans average (46).

ICT STUDENTS

1,288	94%	6%	2019*
1,222	96%	4%	2018*
1,218	96%	4%	2017*

■ bachelor and short-term
□ master's and doctoral
* estimate

ICT GRADUATES

227	96%	4%	2019*
203	94%	6%	2018*
188	94%	6%	2017*

■ bachelor and short-term
□ master's and doctoral
* estimate

ICT EXPORTS

1.48%   1.14%   1.25%

□ % of GDP
□ 2019
□ 2018
□ 2017

ICT VALUE ADDED

3.69%   3.66%   3.72%

EXPORTS

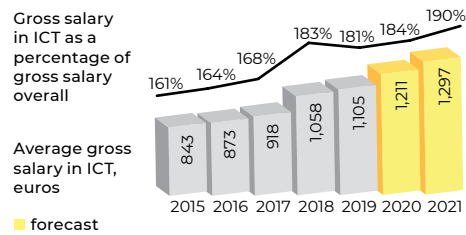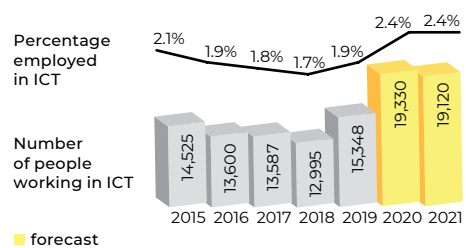|	2015	2016	2017	2018	2019
ICT services (millions, euros)	59.8	55.2	53.8	69.2	56.3
of which **computer services** (millions, euros)	8.2	11.5	12.7	20.0	29.5

NORTH MACEDONIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
2.076	964,014	11,209	5,399	194%	326

North Macedonia's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
17	41	65	67	82	-

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

161% 164% 168% 183% 181% 184% 190%

Average gross salary in ICT, euros

843 873 918 1,058 1,105 1,211 1,297

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

2.1% 1.9% 1.8% 1.7% 1.9% 2.4% 2.4%

Number of people working in ICT

14,525 13,600 13,587 12,995 15,348 19,330 19,120

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT STUDENTS

6,349	95%	5%	2017
5,951	95%	5%	2016
5,766	95%	5%	2015

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

704	81%	19%	2017
567	80%	20%	2016
665	82%	18%	2015

■ bachelor and short-term
■ master's and doctoral

North Macedonia's ICT industry is by far the fastest growing sector of the country's economy. Despite relatively little government support, the industry has managed to grow organically over the past few years. ICT is one of the few sectors of the North Macedonian economy to record a significant trade surplus, making it a reliable source of foreign currency and employment.

Now, there are 1,957 active ICT companies operating in North Macedonia, up from 1,296 in 2016, according to the Macedonian Chamber of Information and Communication Technologies (MASIT). In 2019, the total revenues of the ICT industry were estimated at 880 million euros, 17 per cent up compared to 2016.

In 2019, the number of people working in ICT amounted to 15,348, of which 8,516 were employed in the software and IT services sector. This subsector rose by 69 per cent from 2016 to 2019. Moreover, according to Stackoverflow, there are some 11,600 developers in the country.
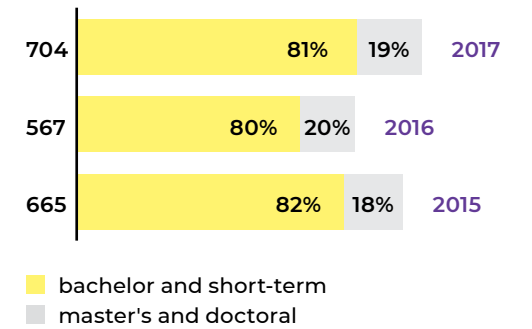
North Macedonia, like many other countries in the region, has an ideal combination of a low-cost yet highly-educated workforce. With 19 higher education institutions in a country of just two million, there is ample opportunity for people to learn vital skills. Over 80 per cent of households have high-speed internet access.

North Macedonia has a low corporate tax rate of just 10 per cent. In fact, the country has universally low tax rates. This is a double edged sword: while it does create a viable environment for businesses to take risks and develop, it also deprives the state of funds which could be used for the improvement of education infrastructure, for example. Although the country has started a more progressive income tax regime, there is no special tax rate for ICT companies. However, company registration is a simple and straightforward process, taking just 24 hours.
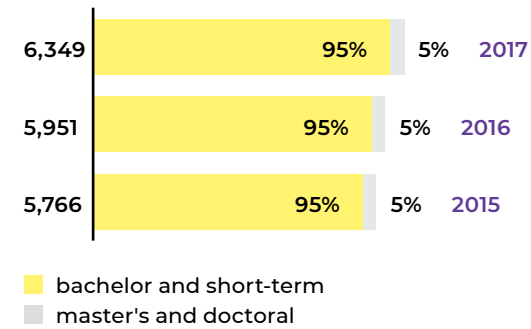
ICT exports have been consistently increasing in North Macedonia, both in terms of sheer numbers and in proportion to GDP. Between 2014 and 2019, ICT exports increased from 121 million euros to 218 million euros, contributing to nearly two per cent of GDP. ICT salaries have been increasing at nearly double the rate of average salaries in the country, a good indication of the strength of the industry. However, North Macedonia still has a high unemployment rate. Despite this, the increasing number of ICT graduates from higher education institutions brings hope that this issue can find a solution within the ICT industry.

According to a country report prepared by the European Commission, there is a need for North Macedonia to develop a long-term digital strategy. The sector also calls for a national framework for coordination between state institutions, the education system and the private sector, where these growth opportunities would be strategically evaluated and acted upon.

North Macedonia ranks 22nd in the IT Competitiveness Index. The country is ranked high in the Ease of doing business ranking, holding 17th position which is the third highest in the region. Nonetheless, it is ranked 111th in the Corruption Perception Index, which is the fourth lowest position in the region. With 739 ICT specialists per 100,000 people, the country ranks significantly lower than the region's average of 1,044 specialists per 100,000 people.

ICT EXPORTS

1.71%

1.95%

1.47%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

3.42%

3.70%

3.39%
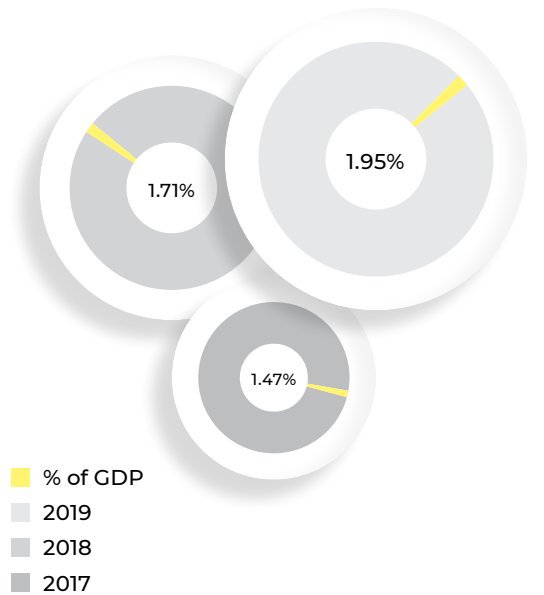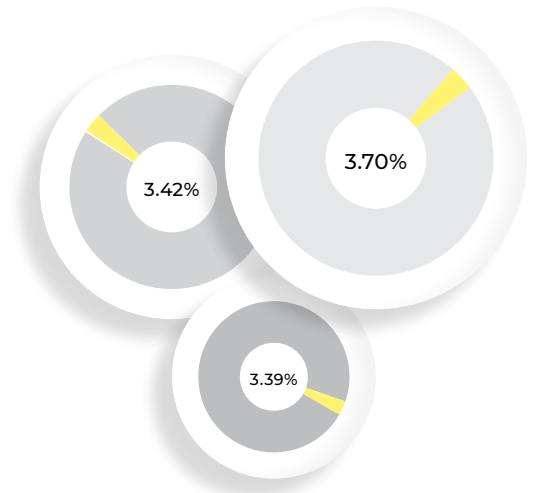
EXPORTS

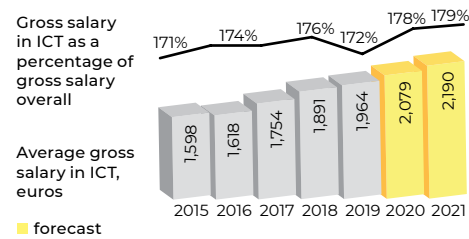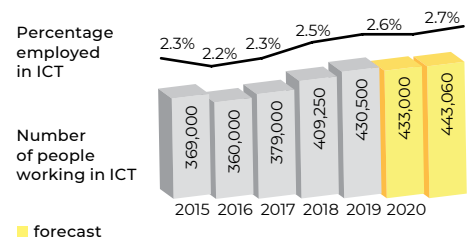|	2015	2016	2017	2018	2019
ICT services (millions, euros)	129.8	150.0	147.5	183.8	218.1
of which computer services (millions, euros)	71.6	93.1	122.4	153.9	187.4

POLAND

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
38.383	17,019,000	532,280	13,868	220%	11,810

Poland's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
40	46	31	10	35	16

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall: 171% (2015), 174% (2016), 176% (2017), 172% (2018), 178% (2019), 179% (2020-21)

Average gross salary in ICT, euros: 1,598 (2015), 1,618 (2016), 1,754 (2017), 1,891 (2018), 1,964 (2019), 2,079 (2020), 2,190 (2021)

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT: 2.3% (2015), 2.2% (2016), 2.3% (2017), 2.5% (2018), 2.6% (2019), 2.7% (2020)

Number of people working in ICT: 369,000 (2015), 360,000 (2016), 379,000 (2017), 409,250 (2018), 430,500 (2019), 433,000 (2020), 443,060 (2021)

■ forecast

CLUTCH TOP PROVIDERS*

No.	Top Software Development	Top Mobile Development	Top IT Services
1	Merixstudio	Droids On Roids	Intellias
2	Jcommerce	Miquido	LCloud Sp. z o.o.
3	The Software House	itCraft	ISCG
4	Future Processing	Netguru	Predica
5	Intellias	Nomtec	Future Processing

*SOURCE: Clutch Leaders Matrix

ICT STUDENTS

	bachelor and short-term	master's and doctoral	
50,236	81%	19%	2019
76,989	81%	19%	2018
74,489	80%	20%	2017

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

	bachelor and short-term	master's and doctoral	
8,747	69%	31%	2019
12,080	67%	33%	2018
11,138	67%	33%	2017

■ bachelor and short-term
■ master's and doctoral

Poland has made huge strides in the past decade to become a true ICT powerhouse. It has a large population and the biggest economy in the region, one that managed to continue growing even after the last global financial crisis. In 2017, the country was classified as a developed market by FTSE Russell.

An EU member state since 2004, Poland has successfully revamped and modernised its economy, allowing it to rise from one of Europe's poorer nations to one of the fastest growing. In recent years, venture capital investment in the ICT industry has skyrocketed and Polish companies have made waves around the world.

Poland has impressively managed to retain both continuous economic growth and lower salaries and costs of living compared to the rest of Europe. Now, there are **dozens of incubators and accelerators for start-ups**. The biggest of these is Reaktor X, based in Warsaw. Start-ups are beginning to appear all over the country as well, not just concentrated in the capital — this decentralisation is a particularly good indicator. Some big names have come out of the start-up scene, like learning programme Brainly or advertising service Filmaster. The country also has a start-up visa, allowing it to poach some of the world's finest ICT talent.
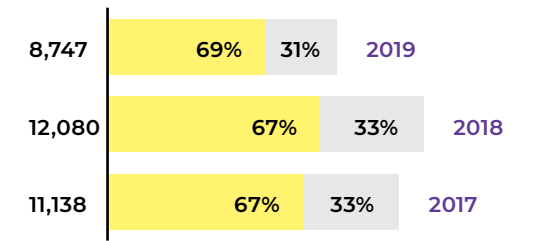
An impressive array of world class companies have research and development centres in Poland: Samsung, Siemens, Microsoft, LG, Google and IBM. This is a ringing endorsement of the level of talent available in the country. In November 2015, **Google opened its first space for start-ups** in Central and Eastern Europe in Poland.
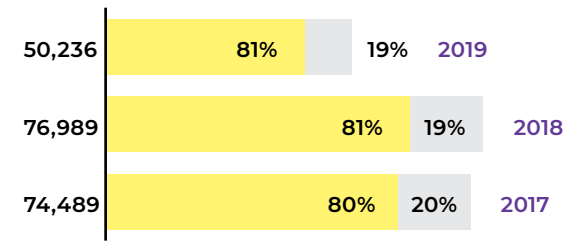
Gaming is becoming Poland's national brand. According to a recent report from the Polish Agency for Enterprise Development, the Polish video game market is now **worth some 470 million euros**, the home of gaming giants such as CD Projekt, PlayWay, 11 bit studios, and Ten Square Games. Currently, there are around 440 game development studios, making everything from so-called AAA games (an industry term to denote the games with the highest budgets) to indie efforts and smaller games played on mobile phones. These studios employ nearly 10,000 people and release almost 500 new games annually: numbers that even just a couple of years ago would have been unthinkable.

Exports of ICT services have been growing very strongly. In 2019, Poland reported 7.7 billion euros in ICT export revenues — up from 3.2 billion euros in 2014. ICT's contribution to GDP has been steadily increasing as well, now coming to represent 1.45 per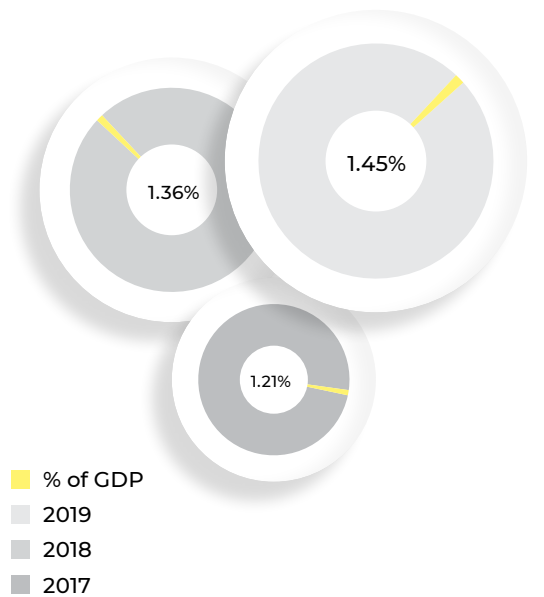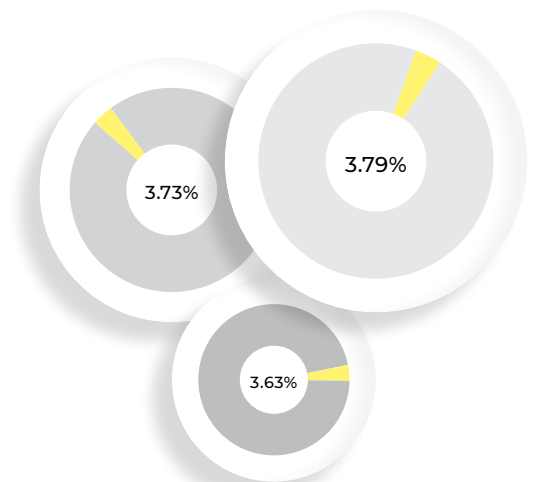 cent of GDP. Unemployment has been decreasing while the proportion of people employed in the ICT sector has been increasing, with Poland now having the highest number of ICT specialists in the region – **430,500 people** were employed in the sector in 2019. Despite this, Poland still hasn't quite lived up to its full potential in this sector, with a comparatively small number of ICT specialists per capita. But all the signs are promising: Poland can safely be considered to be a regional leader in ICT. According to Stackoverflow, there were some **295,300 developers** in the country in 2019.

Poland is ranked first in the IT Competitiveness Index, leading the region in terms of ICT employment, ICT value added and exports in 2019. The high positions in the International Mathematical Olympiad (6th worldwide, the highest in the region) and PISA Mathematics ranking (10th, second highest in the region) proves the quality of the technical background. There is however room for improvement in terms of the number of ICT students and ICT graduates per 100,000 people – at 131 for students and 23 for graduates it is one of the lowest in the region.

ICT EXPORTS

1.36% | 1.45% | 1.21%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

3.73% | 3.79% | 3.63%

EXPORTS

	2015	2016	2017	2018	2019
ICT services (millions, euros)	3,078.2	4,815.4	5,643.6	6,789.5	7,692.2
of which computer services (millions, euros)	2,487.9	4,015.1	4,766.8	5,704.9	6,667.1

POLAND
the IT DESTINATION
your company needs

Located at the very heart of Europe, Poland is currently at the centre of the continent's biggest IT investments.

PAWEŁ PUSTELNIK
MANAGING DIRECTOR
FUTURE PROCESSING

Polish companies draw from the vast pool of experienced, specialised engineers available in the market. They follow the newest trends and implement highly efficient solutions, with Azure Cloud among them.

The Covid-19 pandemic demonstrated to organisations all over the world the importance of digital transformation. Secure, remote access to data, automation, as well as data engineering, is the direction every business should go in if they want to stay with or move ahead of the competition.

A reliable IT software development partner can walk you through the complete product development cycle from creating your IT Strategy through development to the secure maintenance. Among the services offered by IT providers from Poland you can find specialised workshops during which both sides of the process focus on the product's idea, work out its design, architecture or even test a prototype.

All this is done to ensure its perfect adjustment to the market's requirements and business reality.

The final product is well thought through and built by experts with the use of perfectly fit, up-to-date technology. It is not only an investment but a key factor that drives the whole organisation towards the achievement of set goals.

Experienced in remote work Polish IT software services providers can guarantee high efficiency as well as business continuity even in challenging times. During the Covid-19 pandemic, thanks to having the necessary infrastructure, processes and know-how in place, whole organisations smoothly switched to home-office mode (in some cases in 24 hours). Software development companies from Poland proved the stability of their services as projects continued to be developed as planned.

Polish IT companies are no longer simply outsourced software services providers for global financial institutions. They have experience in the industry, specialised know-how and a vast pool of highly qualified experts available in the market. Offering much more than software development, they provide security

engineers, technical consultants, data engineers and business analysts. This competent group follows the newest trends, works within cutting-edge technologies and is open to fintech innovations like the cloud that guarantees data availability and security.

Highly specialised Polish IT companies can give you operational agility so that you can rapidly respond to client demands and set your company apart from its competition in the financial market.

All these, together with the commitment to deliver the highest quality, has resulted in Polish IT companies being treated as valuable, long-term IT partners for the financial sector.

Poland is one of the strongest economies in the region and an EU member with a stable political environment. Starting cooperation with an IT partner from Poland is like choosing a perfect blend of the highest quality service, cultural proximity, understanding of your business reality and cost-effectiveness. And that's a combination appreciated by numerous clients that have entrusted their products - or, in many cases, the whole process of digitalisation - to Polish IT companies. It's visible in the delivered projects, providers' high NPS score, references and reviews on portals such as Clutch.

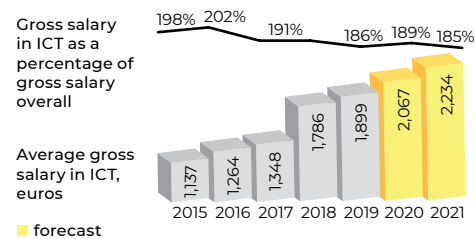Poland is not only the best choice. It is a choice your business needs right now.
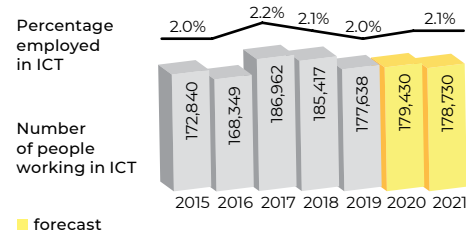
ROMANIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
19.318	9,033,695	223,342	11,561	376%	5,333

Romania's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
55	38	45	52	49	17

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall: 198% 202% 191% 186% 189% 185%

Average gross salary in ICT, euros: 1,137 1,264 1,348 1,786 1,899 2,067 2,234

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT: 2.0% 2.2% 2.1% 2.0% 2.1%

Number of people working in ICT: 172,840 168,349 186,962 185,417 177,638 179,430 178,730

2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

No.	Top Software Development	Top Mobile Development	Top IT Services
1	Roweb Development	Tapptitude	BKHosting
2	Atta Systems**	Wolfpack Digital	InCrys
3	Modus Create	Halcyon Mobile	ComputerSupport
4	AROBS	Atta Systems**	Zenitech
5	Macadamian	Adonis Software	Cubevo Data Concept

* SOURCE: Clutch Leaders Matrix
** Formerly AB4 Systems

Romania has been experiencing an ICT boom for some time. Since 2000, Romania has managed to capitalise on its STEM-heavy education system to become a major outsourcing hotspot. This set the ball rolling for the development of the ICT industry. Between 2007, when Romania joined the European Union, and 2019, the top 50 ICT companies in Romania saw their **turnover quadruple**. Few countries can compare with the combination of quality and quantity in Romania's ICT workforce, whose average salaries remain considerably below Western Europe's average. Furthermore, over 80 per cent of Romanian ICT specialists are proficient in English. With average rent prices in Bucharest half of those in Berlin, Romania looks set to continue its rapid growth in the ICT industry.
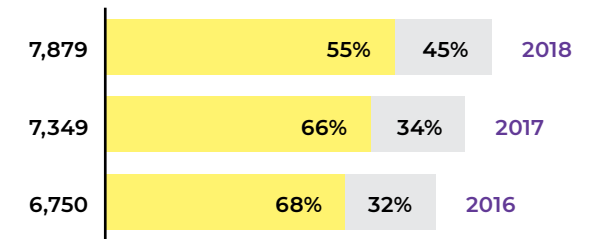
For years, the Romanian government has provided generous subsidies to up and coming businesses in the ICT sphere, demonstrating a commitment to the development of the industry. There is also now plenty of private capital, and VC companies like Gap Minder have offices in the country. Software developers pay no income tax, while the government maintains a flat 16 per cent corporate tax rate for ICT companies. It is also among countries offering a start-up visa to non-EU entrepreneurs and hosts international companies like Amazon, IBM, HP and Microsoft.

In 2013, the university city of Cluj opened the first technological park in Romania, the **Liberty Technology Park**. In 2017, Romania saw its first major ICT success story when the locally-designed Vector smart watch was bought by US company Fitbit. Just a year later, the robotic process automation company UiPath became Romania's first unicorn, reaching an estimated value of over seven billion US dollars since then. In 2018, Romanian universities graduated almost **8,000 students in ICT**, another **39,000 were studying ICT in 2019**.
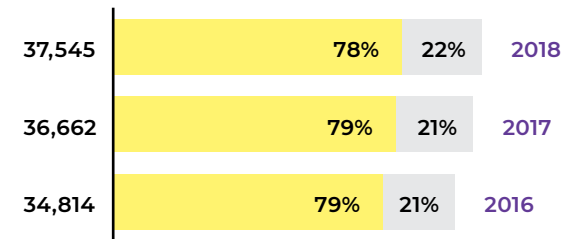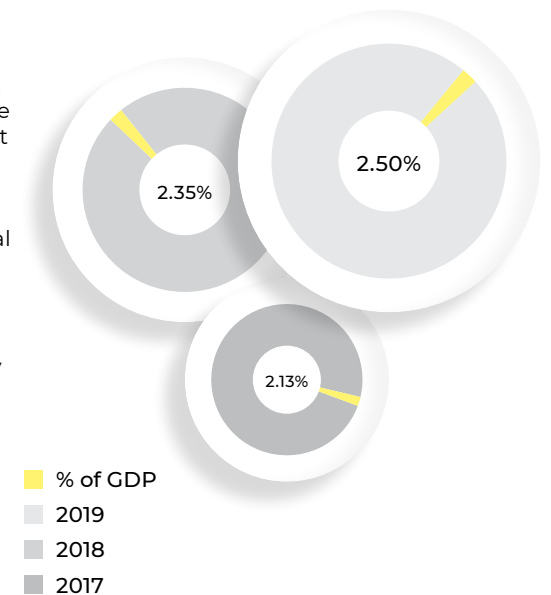
Between 2014 and 2019, Romania's **ICT exports increased by 142 per cent**, with the computer services sub section growing particularly quickly at 173 per cent. ICT exports have come to contribute 2.5 per cent of GDP, with the ICT industry as a whole making up 5.5 per cent in 2019. The industry has further flourished as a result of the Covid-19 pandemic-induced surge in demand for e-commerce. However, Romania ranks poorly in corruption indexes, and has a relatively low internet penetration rate at 74 per cent. These are issues that Romania must tackle before it can fully realise the potential it has shown in the last decade. Nevertheless, the progress made has been impressive.

The Romanian Software Industry Association (ANIS) says that the local IT industry's objectives for Digital Romania in 2025 are for the ICT se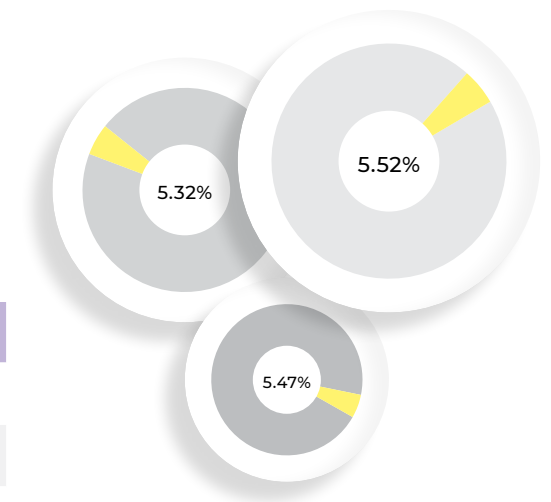ctor to reach **10 per cent of GDP**. **Romania is ranked fifth** in the IT Competitiveness Index. The country is the third largest in the region in terms of number of ICT students and graduates, after Ukraine and Poland respectively. Romania is second only to Poland in terms of value added created in the ICT sector and ICT services exports. In the meantime, Romania's position in the Ease of Doing Business ranking needs improvement, as the country is ranked 55th — the sixth lowest position in the emerging Europe region and the 2nd lowest among the EU member states from the region.

ICT STUDENTS

37,545	78%	22%	2018
36,662	79%	21%	2017
34,814	79%	21%	2016

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

7,879	55%	45%	2018
7,349	66%	34%	2017
6,750	68%	32%	2016

■ bachelor and short-term
■ master's and doctoral

ICT EXPORTS

2.35%   2.50%   2.13%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

5.32%   5.52%   5.47%

EXPORTS

	2015	2016	2017	2018	2019
ICT services (millions, euros)	2,735.0	3,378.5	4,008.5	4,796.7	5,591.8
of which **computer services** (millions, euros)	1,810.1	2,238.8	2,764.0	3,418.4	4,112.4

CLUJ-NAPOCA
A regional hub of digital innovation
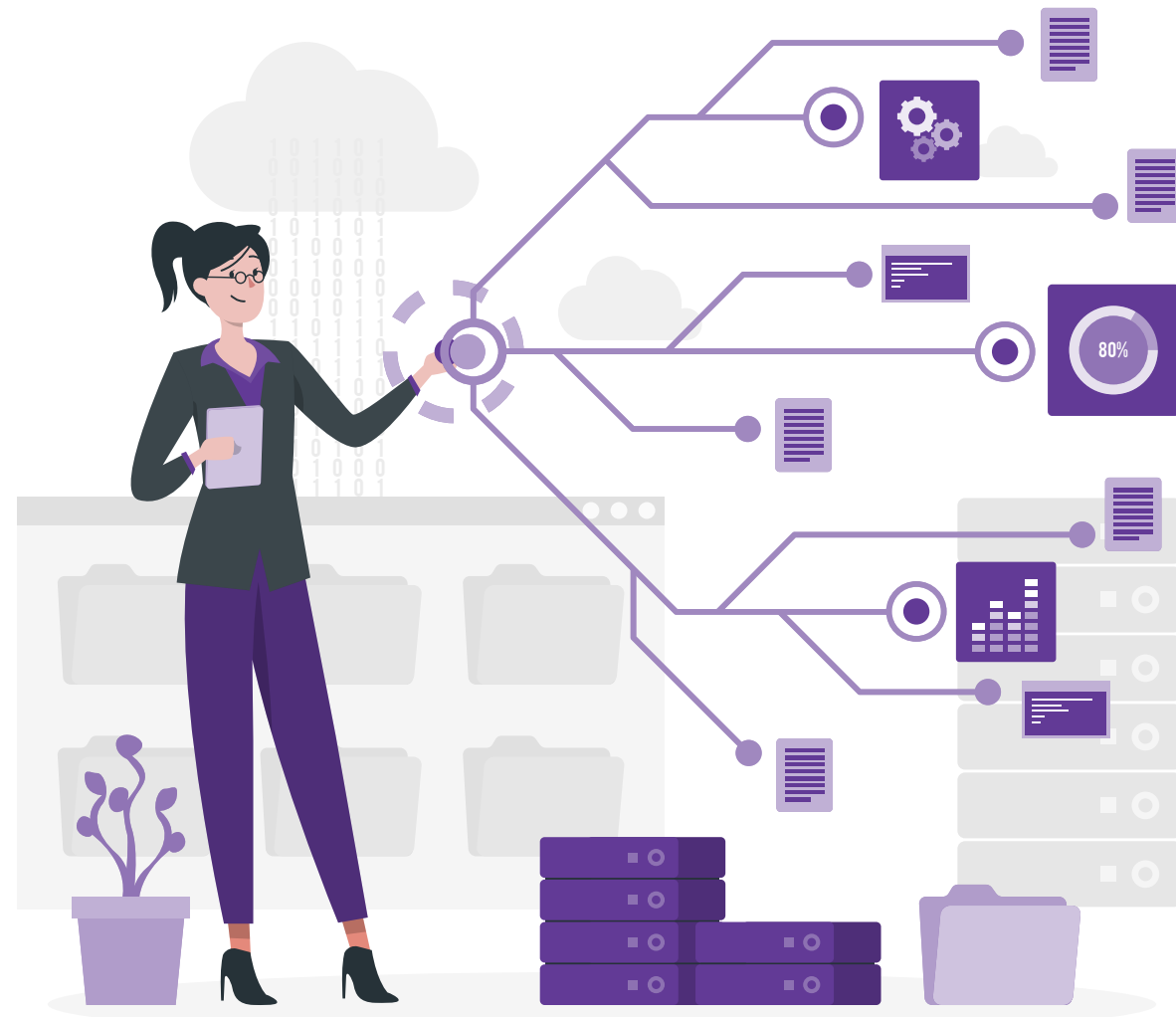
Cluj-Napoca has for several years been on the fast track towards becoming one of the most attractive cities in Central and Eastern Europe, as an academic, tourist and cultural centre. The city's lively and positive vibe is based on a strong business orientation, a developing start-up ecosystem and on the high potential for innovation across many industries and sectors.

It is no secret that one major component of the city's recent advancement is the booming IT industry, which has found fertile ground to quickly emerge and become the backbone for job creation, increased quality of life

and the strong internal migration of young adults looking for education and professional opportunities.

Across Romania as a whole, the IT sector has proven to be a powerful engine of the country's economic development and has been among the few to have registered positive growth during the Covid-19 pandemic. The industry is also growing in terms of relevance to Romania's Gross Domestic Product, as revealed recently by the country's National Institute of Statistics' analysis of the first two quarters of 2020. The IT sector contributed 7.2 per cent in Q1 2020, and 7.4 per cent in Q2, numbers which translate into

growth of 0.7 per cent and 0.6 per cent respectively.

As the consequences of the pandemic continue to generate cascade effects in many layers of our society, we see ourselves, both as communities and organisations as well as individuals, needing to become more resilient and adaptable to change. This is where innovation clusters step in, and in Cluj-Napoca's case, they have transitioned from promoters to champions of digital transformation, offering solutions for the private and public sectors alike.

Cluj IT Cluster has always been an avid practitioner of the

bottom-up approach, both at local and regional level, bringing forward and addressing relevant needs from within the industry and the community it is a part of, while positioning Cluj as a regional hub for digital innovation (a goal that was set out in the founding documents of the organisation in 2012).

The concept took a more tangible form through the establishment of the Digital Innovation Hub for Society (DIH4S), a macro-regional partnership between Cluj IT Cluster, the Technical University of Cluj-Napoca and the Chamber of Commerce and Industry Bistrita-Nasaud, with the support of the North-West Regional Development Agency. DIH4S is designed on the belief that digital technologies can fundamentally contribute to the foundation of a smart, safe and sustainable society. This is a citizen-centred vision for increased quality of life,

through the smart and ethical use of the most advanced digital technologies.

Changing mentalities is not easy, but the cluster has been working continuously in this direction, since its establishment, playing a central role in repositioning the city's decision maker's perspective towards a smart and innovative approach in strategic urban development.

These efforts first culminated in 2014 with Cluj Innovation City, an integrated development concept proposed by the cluster to the municipality, at a moment when the terrain for substantial change was beginning to show signs of fertility. This has generated a powerful rebranding strategy for the whole city.

Consequently, for the last eight years "innovation" has become part of everyday life, in business and administration. The most recent highlight is the qualification of

Cluj-Napoca as a finalist in the European Capital of Innovation 2020 competition, along with cities such as Milan, Valencia and Vienna. Leuven won the title, but Cluj-Napoca is so far the only Eastern European city to have ever been selected in this prestigious EU competition.

Despite the current difficult global situation, expectations remain high in a city driven by the desire to change for good, to create opportunities and embrace the future.
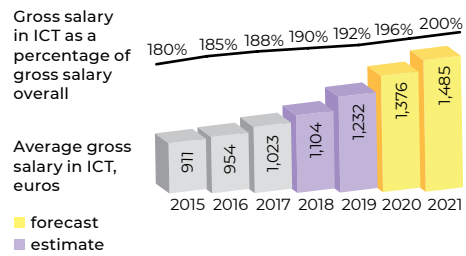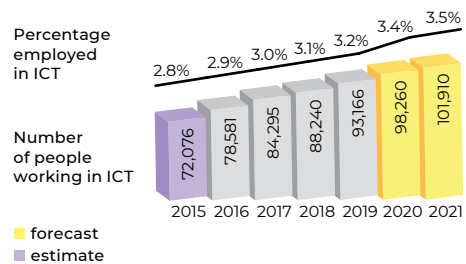
SERBIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
6.927	3,236,875	45,970	6,637	192%	4,096

Serbia's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
44	65	52	46	64	15

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall: 180%, 185%, 188%, 190%, 192%, 196%, 200%

Average gross salary in ICT, euros: 916, 954, 1,023, 1,104, 1,232, 1,376, 1,485 (2015, 2016, 2017, 2018, 2019, 2020, 2021)

- forecast
- estimate

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT: 2.8%, 2.9%, 3.0%, 3.1%, 3.2%, 3.4%, 3.5%

Number of people working in ICT: 72,076, 78,581, 84,295, 88,240, 93,166, 98,260, 101,910 (2015, 2016, 2017, 2018, 2019, 2020, 2021)

- forecast
- estimate

CLUTCH TOP PROVIDERS*

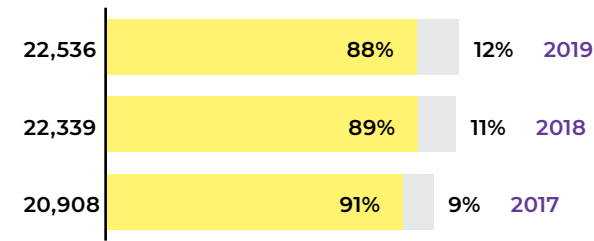| No.	Top Software Development	Top Mobile Development	Top IT Services
1	Rare Crew	K7 Tech	Rare Crew
2	BrightMarbles	We Are OSM	Braineering IT Solutions
3	Ingsoftware	Bstorm	SmartCat
4	Vega IT Sourcing	ZESIUM	SuperAdmins
5	JSGuru	BDIT Engineering	Tnation

*SOURCE: **Clutch Leaders Matrix**

Serbia is another nation which has come a long way in the development of its ICT industry and looks positioned to become a powerhouse. Even today, Serbia is arguably the ICT leader of the Western Balkans. As with many other countries in the region, it has a strong background in technical fields.

Microsoft opened just its **fifth global development centre in Serbia** in 2005, recognising the country's potential. Since then, Serbian ICT companies have found particular success in the gaming and blockchain sub sectors. Dozens of well-known international companies like Adobe and Siemens have joined Microsoft in maintaining offices in the country.

Serbian gaming development companies like Nordeus have produced chart-topping games such as football management simulator *Best Eleven*, which has some 200 million downloads on the app store. In 2018, Serbian gaming companies brought in more than 100 million euros in revenue. Start-ups have dozens of incubators and accelerators to choose from, although early-stage funding remains at a lower level than the EU average. All in all, Serbia has an estimated **2,500 ICT companies**, with the sector one of the fastest growing in the economy for the last five years.
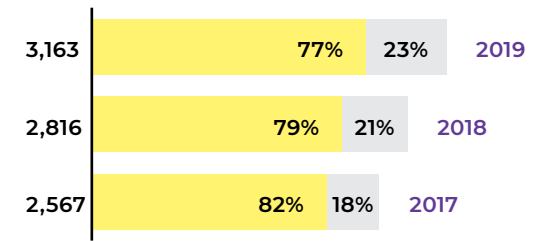
Serbia has also begun to develop a strong blockchain sector, which looks set to be given a boost after the government proposed a Law on Digital Assets in 2020. In 2019 and 2020, Serbia placed fifth worldwide in sheer number of blockchain developers. Serbian blockchain company MobileGo reached a **valuation of 56 million US dollars** in 2020.
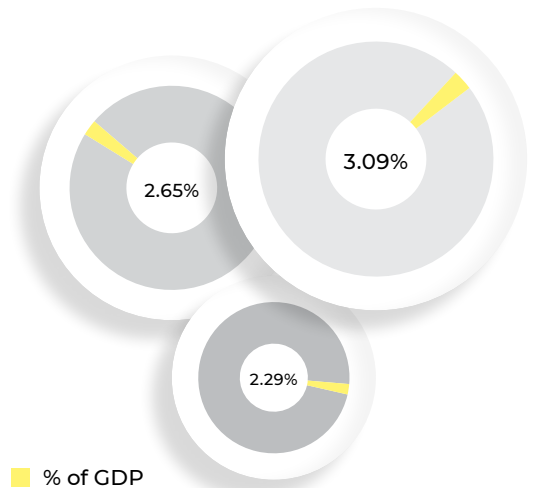
In 2017, the Serbian government unveiled a strategy for the further development of the ICT industry, targeting **1.5 billion euros in ICT exports** by 2020 and promising to increase the numbers of ICT specialists produced, improve infrastructure and create more favourable legal frameworks for ICT companies. In 2019, the Serbian government was very close to its goal of generating 1.5 billion in ICT export revenues, when it reported **over 1.4 billion euros**, a nearly threefold increase from 2014. Now these contribute to more than three per cent of the country's GDP.

Serbia's proportion of ICT students among the general student population has also been increasing. However, Serbia's population has been experiencing a slow but steady decline for nearly 30 years now, due to emigration and low birth rates. Now, **from fifth grade, computer science classes are compulsory in the Serbian curriculum**. In 2015, the first bit of innovation infrastructure was unveiled with Belgrade's Science and Technology Park. Novi Sad's technological park was unveiled in early 2020, and two more are currently under construction in Nis and Cacak, with a collective investment of 70 million euros.
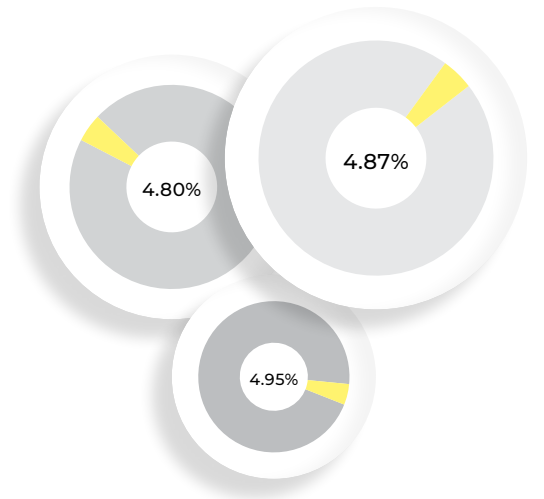
Serbia is ranked seventh in the IT Competitiveness Index. The country has the second highest number of ICT students per 100,000 people in the emerging Europe region and the fifth highest number of ICT graduates per 100,000. The high level of English competence ranks it fourth among the countries of the region and 15th globally, improving its position by three notches compared to 2018. Nevertheless, there is a room for improvement in the amount of value added in ICT per capita.

ICT STUDENTS

22,536	88%	12%	2019
22,339	89%	11%	2018
20,908	91%	9%	2017

- bachelor and short-term
- master's and doctoral

ICT GRADUATES

3,163	77%	23%	2019
2,816	79%	21%	2018
2,567	82%	18%	2017

- bachelor and short-term
- master's and doctoral

ICT EXPORTS

2.65%
3.09%
2.29%

- % of GDP
- 2019
- 2018
- 2017

ICT VALUE ADDED

4.80%
4.87%
4.95%

EXPORTS

	2015	2016	2017	2018	2019
ICT services (millions, euros)	610.8	739.5	898.9	1,134.6	1,422.4
of which **computer services** (millions, euros)	454.7	589.8	759.7	1,016.1	1,269.6

ZESIUM

Your Partner for Your Idea

**DARKO MILIĆ**
Chief Executive Officer at
Zesium Mobile d.o.o

With **Covid-19** impacting the global trade, many companies had to reshape their work operational processes.
Investing in technology and developing a successful risk management strategy has proven to be a wise way to overcome the dangers without any operation continuity gaps.
The pandemic has affected all industries but also revealed an urgent need for businesses to transfer their business operations online.

Although the IT sector in Serbia witnessed a minor decrease in 2020, Zesium managed to achieve the growth during the same period. **For over 17 years,** we have worked with ambitious entrepreneurs & brands and helped them take their ideas out to the market and improve their business results.
Zesium managed to contribute to the current need for business digitization by building real life products.

Having close ties with **The Faculty of Technical Sciences** from Novi Sad Serbia, we have the opportunity to gather the brilliant minds to work on research programs for the better future across challenging projects including Artificial Intelligence, Signal Processing, IoT.

The current focus of Zesium remains clear:

to respond to the increasing need for technology innovation and digital transformation with our top talents and high quality products.
Our quick business adaptation in 2020 along with our proactive approach and innovative spirit represent a strong foundation for our future growth.
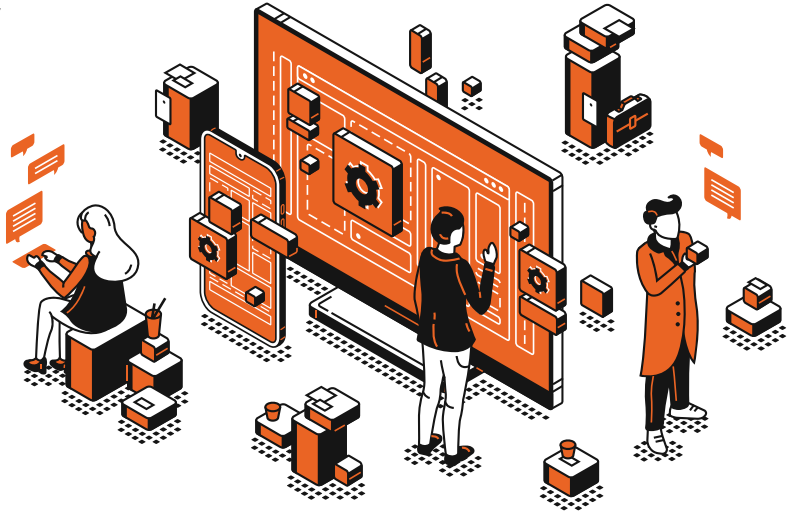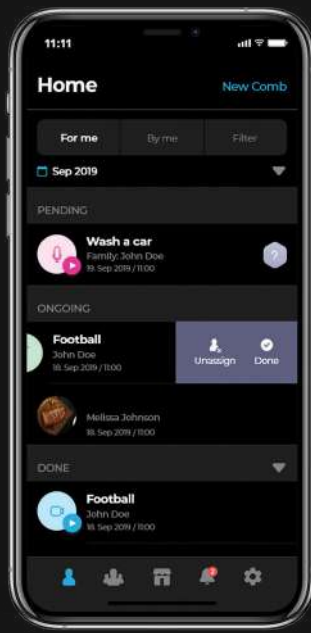
Zesium mission and vision is to inspire change and help our partners tackle their biggest challenges.

We have developed software, web and mobile solutions for our partners from diverse industries.

Our solutions helped them to tackle problems in different areas:

Urban mobility
(solution to parking problem in crowded urban areas)

Smart traffic and logistics
(Communication platforms and marketplaces using geolocation and payment within system)

Business process management
(integration of planner and messaging system with rewards, event booking apps)

Agile manufacturing
(Automatic system for monitoring consumption in manufacturing processes and data analysis using IoT implementation)
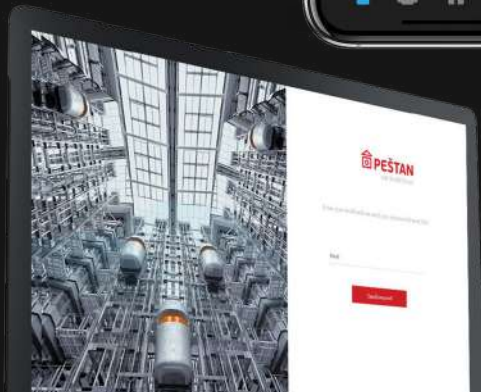
eCommerce
(sales automation, web shops, expanding reach with ecommerce mobile apps and gamification)

Do you want to transfer your IDEA to LIFE?

Share your vision with ZESIUM and build solutions that last!
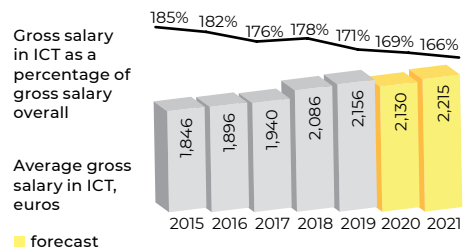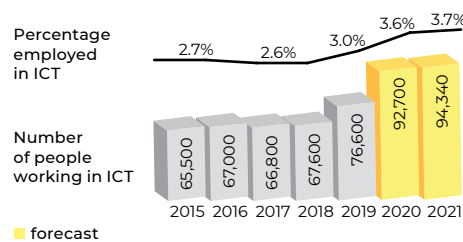
www.zesium.com

ZESIUM

SLOVAKIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
5.458	2,741,400	93,865	17,198	203%	2,187

Slovakia's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
45	60	36	32	39	22

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall: 185% (2015), 182% (2016), 176% (2017), 178% (2018), 171% (2019), 169% (2020), 166% (2021)

Average gross salary in ICT, euros: 1,846 (2015), 1,896 (2016), 1,940 (2017), 2,086 (2018), 2,156 (2019), 2,130 (2020), 2,215 (2021)

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT: 2.7% (2015), 2.6% (2016), 3.0% (2017), 3.6% (2018), 3.7% (2019)

Number of people working in ICT: 65,500 (2015), 67,000 (2016), 66,800 (2017), 67,600 (2018), 76,600 (2019), 92,700 (2020), 94,340 (2021)
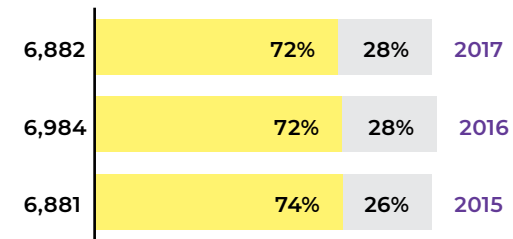
■ forecast

Slovakia is a country that is best known for its manufacturing industry. However in recent years, it has also began picking up steam in the ICT sphere. Since splitting from Czechia in 1993, Slovakia has begun moving away from its industrial roots to becoming yet another outsourcing destination in the ICT field. Since joining the European Union in 2004 and the eurozone in 2007, Slovakia has gained access to European Union funds and markets, greatly accelerating its progress.

Now, Slovakia's ICT industry employs 2.9 per cent of the workforce yet creates the value added equal to three per cent of GDP. As of 2019, there were **76,600 people employed in the ICT sector**. The number of developers was estimated to be some 39,500, according to Stackoverflow.

Almost 90 per cent of Slovakians are fluent in at least two languages, giving the country an adaptable and multicultural workforce. Furthermore, salaries are predictably lower than in most of the rest of Europe, making Slovak companies competitive, particularly within the European Union.

Seven faculties at six universities give classes in ICT subjects as well as support platforms for innovative business ideas. Slovakian ICT companies have been particularly successful in the gaming sub sector, where between 2017 and 2019 revenues **increased from 36 million euros a year to 51 million euros**. One of the most successful of these Slovakian gaming software companies is Pixel Federation, which is one of the world's major Facebook game developers.

Some 87 per cent of the country has 4G coverage, with plans for 5G installation being implemented.

Today, there are four ICT-oriented technology parks in Slovakia, including the STU Science Park at the University of Bratislava. These offer guidance, mentoring, networking events and talks to start-ups. Although the development of the start-up scene has been hampered by more stringent bureaucratic regulations than normally seen in European Union countries, there are still some success stories. One of the most exciting Slovakian start-ups is Aeromobil, which is attempting to develop a 'roadable aircraft' or flying car.

The game development industry in Slovakia has been gaining pace by uniting a wide range of studios. This rapidly growing market which nearly doubled revenues over the past two years is the result of the world's top industry professionals teaming up with relevant educational programmes, shaping ne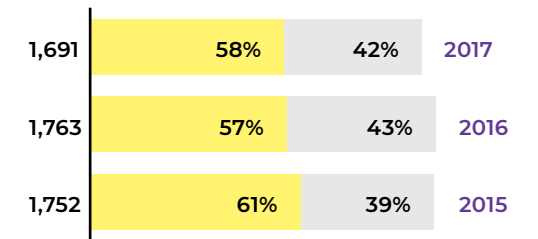w generations of game developers. It is expected to have generated **55 million euros in revenue in 2020, 50 per cent more than in 2017**.

Slovakia's total ICT exports in 2019 were almost double what they were in 2015. However, the share of the GDP that these exports generate has been stagnant at around 1.6 per cent. Furthermore, Slovakia ranks high in the English proficiency index, with some 95 per cent of school age students learning the language. These factors, along with the undeniable growth of the ICT industry, bode well for the future of Slovakia.
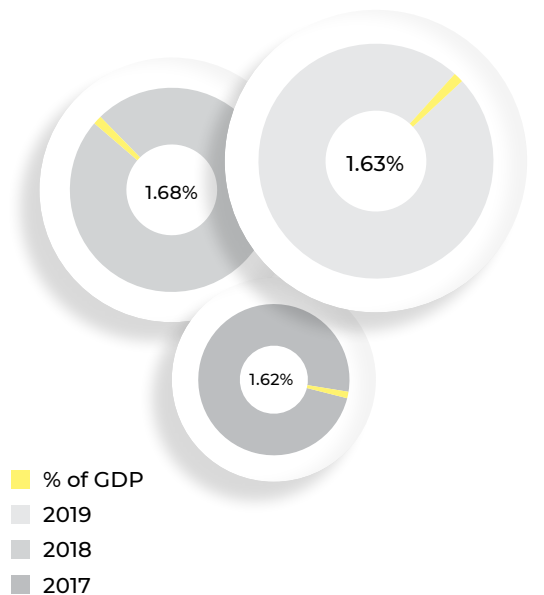
Slovakia is ranked 13th in the IT Competitiveness Index. The state of talent and its further enlargement is the key for ICT sector development. The country is ranked the second lowest in the emerging Europe region in terms of the number of ICT students per 100,000 people, but the number of ICT specialists per 100,000 is among the highest in the region. The quality of potential future ICT talent is proved by the fairly good position in the PISA Mathematics ranking – sixth in the emerging Europe region and 32nd globally.

ICT STUDENTS
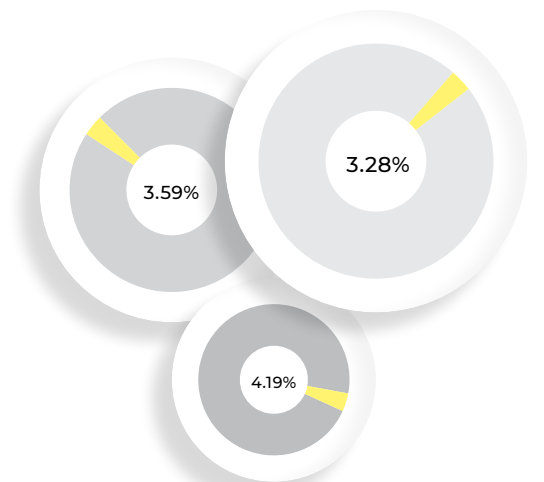
6,882	72%	28%	2017
6,984	72%	28%	2016
6,881	74%	26%	2015

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

1,691	58%	42%	2017
1,763	57%	43%	2016
1,752	61%	39%	2015

■ bachelor and short-term
■ master's and doctoral

ICT EXPORTS

1.68%

1.63%

1.62%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

3.59%

3.28%

4.19%

EXPORTS

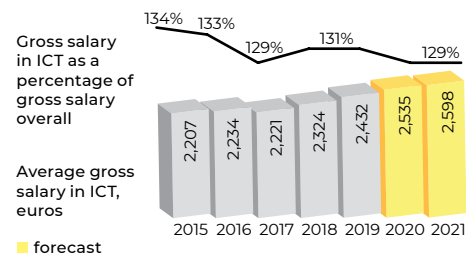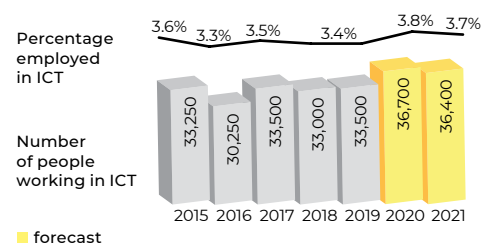|	2015	2016	2017	2018	2019
ICT services (millions, euros)	768.8	1,087.1	1,369.3	1,499.4	1,526.8
of which **computer services** (millions, euros)	456.9	744.9	957.6	1,084.3	1,089.1

SLOVENIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
2.096	1,029,000	48,393	23,090	139%	813

Slovenia's position in international rankings					
Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 88) (2018)
37	52	22	14	22	9

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

134% 133% 129% 131% 129%

Average gross salary in ICT, euros

2,207 2,234 2,221 2,324 2,432 2,535 2,598

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

3.6% 3.3% 3.5% 3.4% 3.8% 3.7%

Number of people working in ICT

33,250 30,250 33,500 33,000 33,500 36,700 36,400

2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

| No.	Top Software Development	Top Mobile Development
1	Infinum	Infinum
2	Kaldi IT	Devvela
3	ABC Tech Group	Kamino
4	Shape Labs	mova.io
5	Positiva	Equaleyes Solutions Ltd

*SOURCE: Clutch Leaders Matrix

Slovenia has recently been taking initiatives to emulate the success of other small countries through developing its ICT sphere. Since independence in 1991, it has been taking steady steps towards this. A member of the European Union since 2004 and the eurozone since 2007, Slovenia is well-integrated into the European economy and has benefited greatly from this partnership. Now hosting two world-renowned universities, an impressive feat in a country of just over two million, Slovenia has the foundation to become another major location in the world of ICT.

Since 2000, Slovenia's percentage of Internet users increased from fifteen per cent to over 83 per cent. The country has also made great progress in English proficiency, ranking ninth in the world in 2018 according to the EF English proficiency index. This makes the Slovenian labour force cosmopolitan and adaptable, keeping in character with the country's history.

Start-ups have been blossoming. A major help for start-ups is the Technology Park Ljubljana, which was established all the way back in 1996. The cloud computing sub sector has seen particularly quick growth, with the country's ministry of public administration **allocating 38 million euros** to develop a cloud computing system. One of the most promising Slovenian start-ups is GenePlanet, which carries out non-invasive screening of birth conditions, a promising new frontier in medical research.
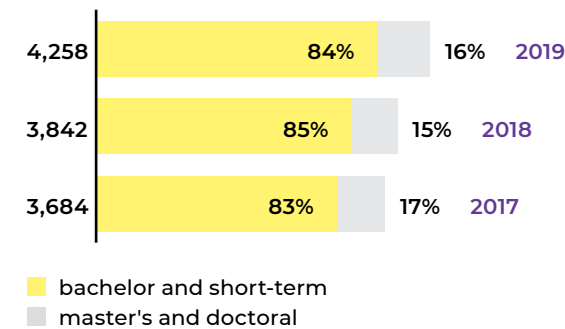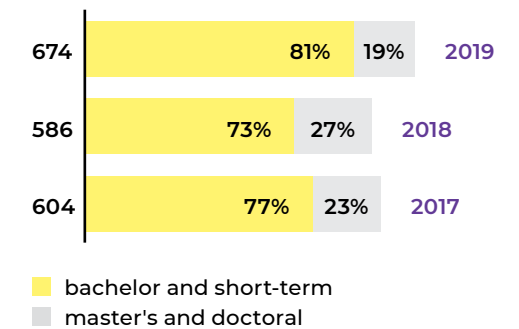
In 2017, the Slovenian government launched its action plan to **stimulate the ICT industry and start-up scene**. The plan promised to simplify company registration requirements, remove bureaucratic hurdles, create a start-up register for easier access to local and international funding, and amending the law on foreign workers to allow ICT companies to employ non-EU citizens.

Although Slovenia's ICT exports have been slowly increasing over the past few years, the proportion of the GDP they represent remains stagnant at around 1.3 per cent. While this could be because of the impressive growth of the rest of the economy, it is also an indicator that the industry isn't growing fast enough. This is reflected by how average salaries in the ICT industry (which are highest in the Western Balkans) are outpacing average salaries in the rest of the economy. However, the increase in turnover still bodes well for the future and the government's 2017 action plan at least shows that there is the willingness to allow the ICT industry to flourish.
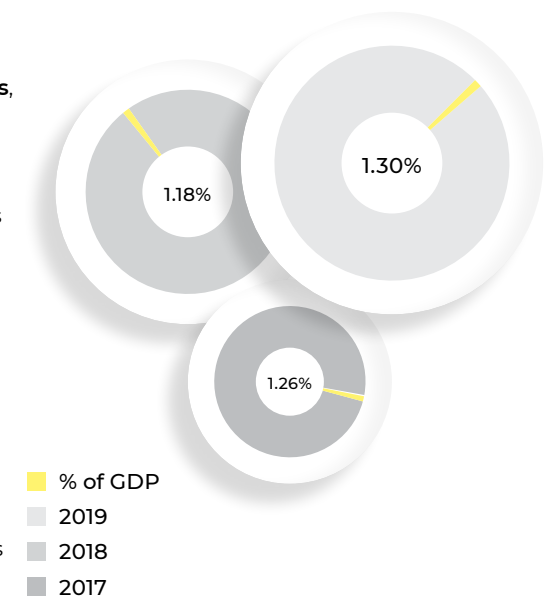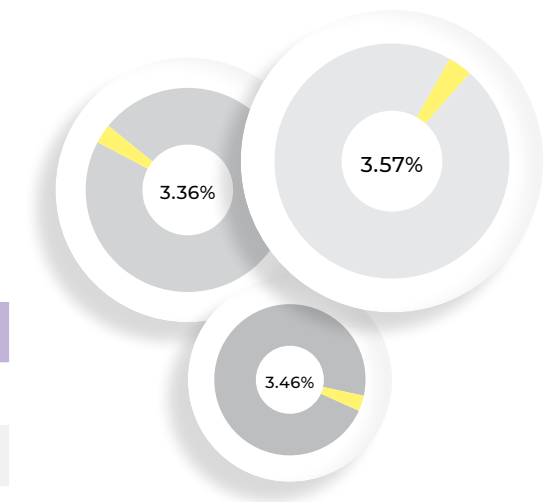
Slovenia's information and communications technology (ICT) sector recorded a 6.9 per cent rise in turnover last year, to **4.4 billion euros**, according to the country's statistical office. The ICT sector's turnover represents 4.2 per cent of the total generated by all active enterprises in Slovenia. The ICT sector comprises companies active in the production of information-communication technologies and firms active in the provision of ICT services. The value added generated by the overall ICT sector also rose, by 12 per cent to 1.6 billion euro in 2019.

Slovenia ranks sixth in the IT Competitiveness Index. The country ranks second among the emerging Europe region in terms of the number of people employed in ICT per 100,000, with 1,598 ICT specialists compared to the emerging Europe's average of 1,044 in 2019. The country has the highest position in terms of human development (22nd globally in the Human Development Index) and social progress (22nd globally in the Social Progress Index), as well as the highest level of English competence.
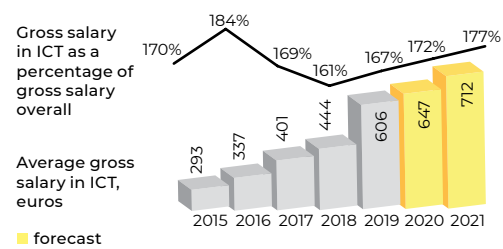
ICT STUDENTS

4,258	84%	16%	2019
3,842	85%	15%	2018
3,684	83%	17%	2017

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

674	81%	19%	2019
586	73%	27%	2018
604	77%	23%	2017

■ bachelor and short-term
■ master's and doctoral

ICT EXPORTS

1.18%　　1.30%

1.26%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

3.36%　　3.57%

3.46%

EXPORTS

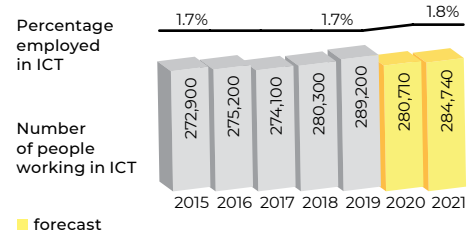|	2015	2016	2017	2018	2019
ICT services (millions, euros)	518.5	551.8	543.6	539.5	628.7
of which **computer services** (millions, euros)	134.3	160.7	172.1	205.7	253.4

UKRAINE

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
41.733	18,066,000	137,282	3,290	178%	2,741

Ukraine's position in international rankings

Ease of Doing Business (of 190)	Index of Economic Freedom (of 180)	Social Progress Index (of 163)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 100)
64	134	63	43	74	44

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

170% — 184% — 169% — 161% — 167% — 172% — 177%

Average gross salary in ICT, euros

293 — 337 — 401 — 444 — 606 — 647 — 712

2015 2016 2017 2018 2019 2020 2021

■ forecast

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

1.7% — 1.7% — 1.8%

Number of people working in ICT

272,900 — 275,200 — 274,100 — 280,300 — 289,200 — 280,710 — 284,740

2015 2016 2017 2018 2019 2020 2021

■ forecast

CLUTCH TOP PROVIDERS*

No.	Top Software Development	Top Mobile Development	Top IT Services
1	DOOR3	DOOR3	Intellias
2	Jelvix	Jelvix	IT Svit
3	N-iX	N-iX	SoftServe
4	Waverley Software	Waverley Software	Dysnix
5	Future Processing	Future Processing	Future Processing

*SOURCE: Clutch Leaders Matrix

Ukraine is a sleeping ICT giant. With a large and highly-educated population, Ukraine has ample human capital. This, combined with relatively low costs of living, makes it one of the world's most popular outsourcing destinations.

A government working group involving leading economists and business representatives is currently developing a National Economic Strategy that will identify the vectors of economic development with clear KPIs by 2030, with the digital economy being one of the key components.

With the nation moving towards greater integration with the European Union, Ukraine has undoubted potential in becoming an ICT powerhouse. Now, it is estimated that there **between 450 and 550 start-ups** both based and founded in Ukraine.

Ukraine's ICT sphere is synonymous with outsourcing. Out of the Top Global Outsourcing 100 list published by the International Association of Outsourcing Professionals (IAOP), seven companies are headquartered in Ukraine, far more than in any other emerging Europe country. A few others, although officially headquartered elsewhere, have their main delivery centres in Ukraine.

Foreign companies capitalise on the rare combination of a relatively large, highly-educated and cheap labour force (Ukraine has Europe's lowest GDP per capita). Consequently, **more than 60 per cent of Ukrainian ICT specialists** are employed by outsourcing companies. Primarily occupied with data management,
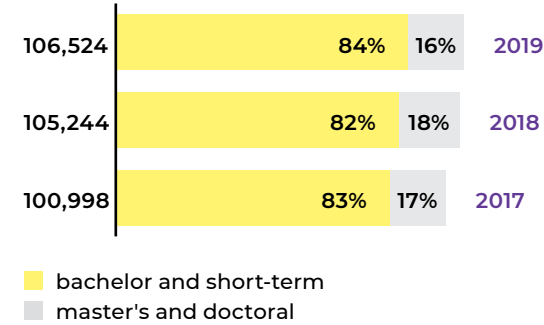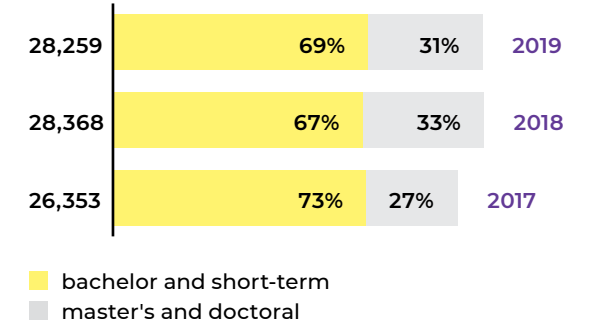
telecommunications and gaming, Ukraine's IT talent has not gone unnoticed. International heavyweights like Microsoft, Google and Ubisoft all have offices in Kyiv.

In recent years, private companies have taken ambitious steps to improve Ukraine's ICT infrastructure. The first such institution is Kyiv's UNIT.City, an 'innovation park', which was unveiled in 2017. Lviv is following suit with the construction of its own Innovative IT Park Quarter. Projected to be completed by the end of 2021, this complex will hold a residential area for ICT specialists, creating a self-contained 'village' of sorts for like-minded professionals. The completion of these ambitious projects will undoubtedly propel Ukraine's quickly-growing ICT industry to new heights and help the country realise its vast potential.

Both in sheer numbers and per capita, Ukraine dwarfs most of its neighbours in ICT specialists and students. This is down to its relatively large (albeit rapidly declining) population, which can be considered one of the country's biggest strengths. However, Ukraine still has work to do in creating a viable business environment, with corruption and inefficient governance hampering what progress has been made.

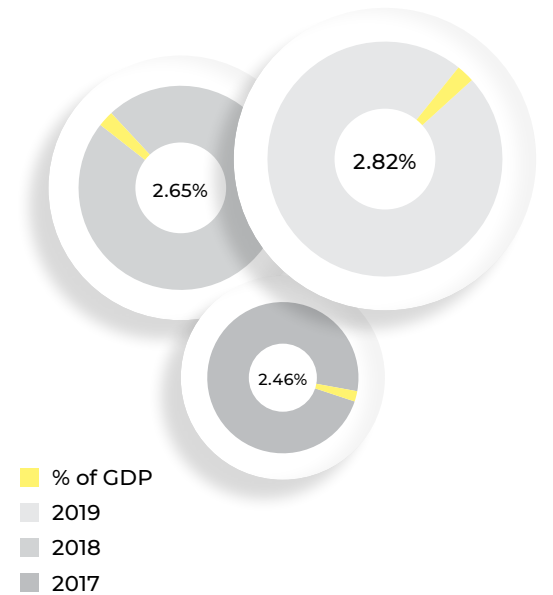Ukraine is also strengthening its position on the global tech

scene by increasing the volume of investments attracted from around the world. It is also becoming a home for unicorns and an R&D hub for foreign companies. Ukrainian investors made 29 exits in 2019, with the average transaction check **growing by 78 per cent to 5.7 million US dollars**, according to the Ukrainian Venture Capital and Private Equity Association (UVCA). Software companies have been leading in the number of deals and volume, moving the "online service" sector to second place. The volume of TOP-10 transactions has almost doubled to 456 million US dollars.

Ukraine is ranked 11th in the IT Competitiveness Index. The country is the second largest in emerging Europe in terms of the number of people employed in the ICT sector. In 2019, there were about 289,200 of people working in ICT. Nevertheless, the number of ICT specialists per 100,000 people is the fifth lowest, which means there is room for improvement and further growth. The number of ICT students and graduates is the highest in the emerging Europe region, which gives hope of a further increase in ICT employment. However, Ukraine does not perform well in either the Ease of Doing Business ranking (64th globally) or the Corruption Perception Index (117th globally).
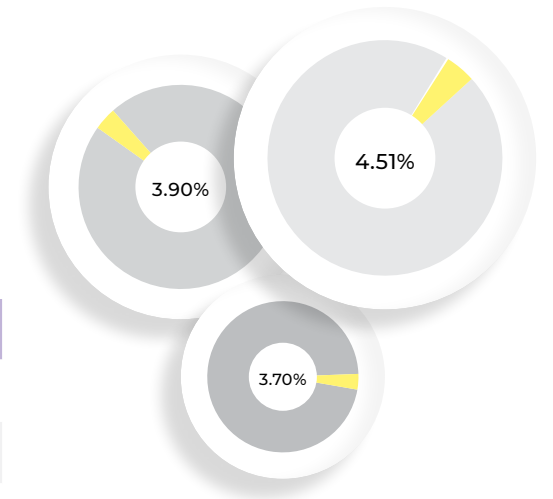
ICT STUDENTS

106,524	84%	16%	2019
105,244	82%	18%	2018
100,998	83%	17%	2017

■ bachelor and short-term
■ master's and doctoral

ICT GRADUATES

28,259	69%	31%	2019
28,368	67%	33%	2018
26,353	73%	27%	2017

■ bachelor and short-term
■ master's and doctoral

ICT EXPORTS

2.82%
2.65%
2.46%

■ % of GDP
■ 2019
■ 2018
■ 2017

ICT VALUE ADDED

4.51%
3.90%
3.70%

EXPORTS

	2015	2016	2017	2018	2019
ICT services (millions, euros)	1,897.9	2,086.2	2,446.5	2,939.0	3,866.3
of which **computer services** (millions, euros)	1,503.9	1,783.7	2,202.8	2,711.3	3,725.3

UKRAINE: Speed of Growth

VALERY KRASOVSKY
CEO & CO-FOUNDER
AT SIGMA SOFTWARE GROUP

The Ukrainian tech industry is booming. You've probably heard about Readdle, MacPaw, Depositphotos or Petcube: these are all Ukrainian companies. The local IT sector is growing five times faster (25 per cent) than the global average (four-six per cent). Ukraine is also considered a leading outsourcing destination and has an army of 220,000 top-notch developers.

A young country, Ukraine is a hotspot for all things new. The country is constantly changing, and while this may affect economic stability, it also makes it cheaper and, indeed, faster to "move fast and break things". Such "entrepreneurial agility", combined with an enormous pool of talent has been a fertile soil for many entrepreneurs.

Lately there have been multiple success stories in Ukraine such as Ajax Systems, Reface, Preply, Allset and many more. Over the past six years Ukrainian start-ups raised two billion US dollars in venture capital investment, creating Ukraine's first two unicorns — Grammarly and GitLab.

Once famous solely for its rich engineering heritage and technical skills, Ukrainian talent has quickly become much more competitive in project and product management, marketing and business development, design and other similar competencies. There has been extensive investment in learning infrastructure, which led to the creation of multiple successful schools and courses, incubators, corporate accelerators and communities.

The Ukrainian IT service industry has been growing its extensive expertise for the last 25 years. Today, Ukraine occupies the number one spot in Europe based on the volume of IT service exports. Leading international companies have set up over 110 R&D centres, while 21 Ukrainian service companies are included in the Global Outsourcing 100 list.
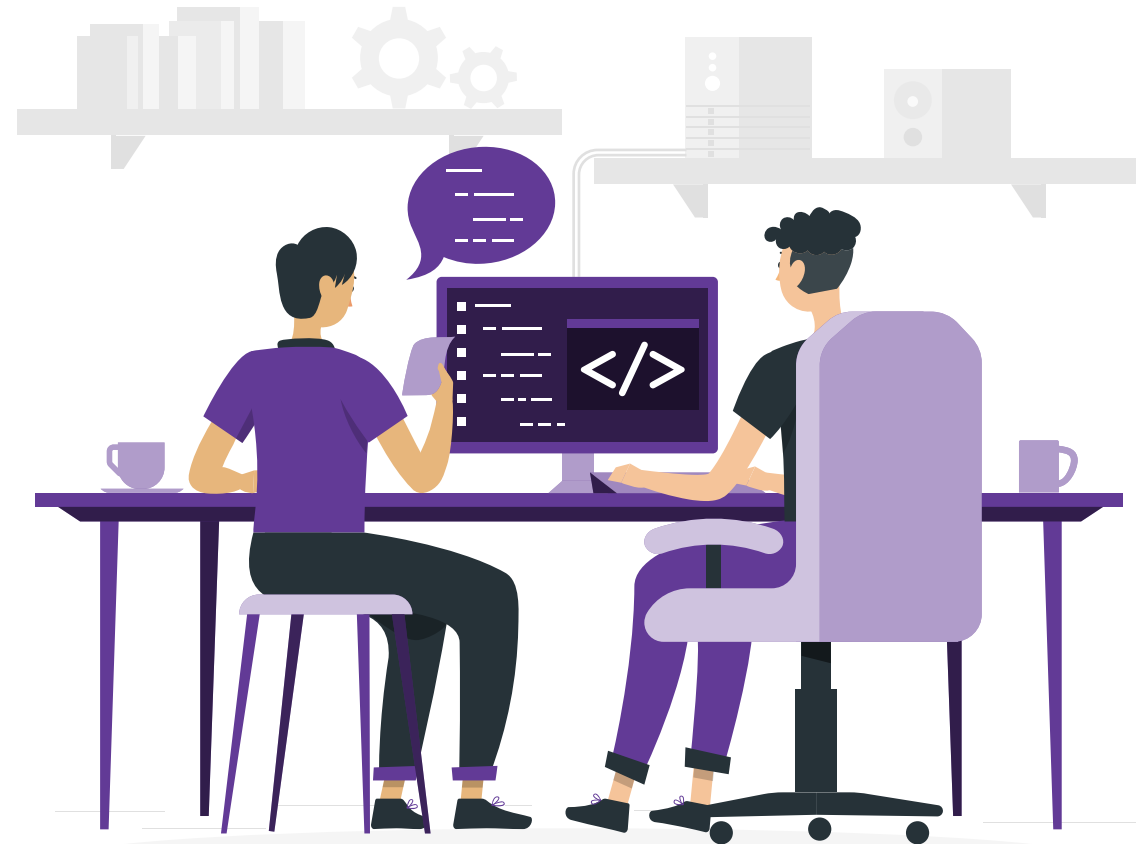
Sigma Software is ready to be your reliable and trusted guide to this promising market.
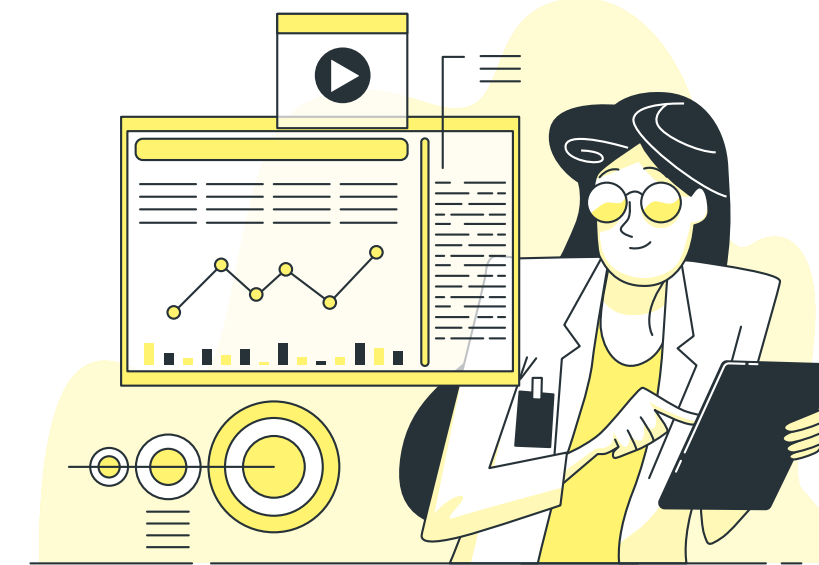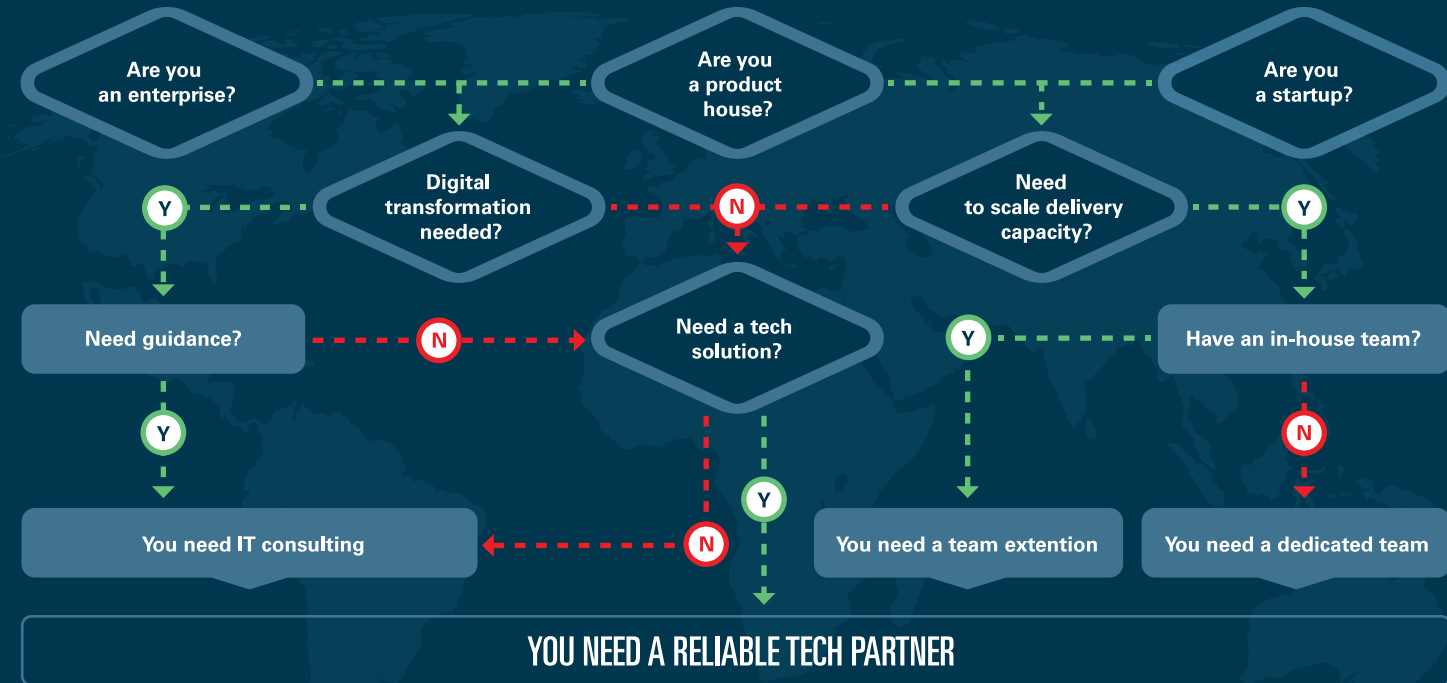
Sigma Software is a pioneer of the Ukrainian IT service industry, standing at its origins since 2002. The company shares its vast business network with its clients extending the scope of opportunities available to them. Sigma Software creates additional value for its customers and reduces their costs by using its own engineering platforms and by integrating 20+ partners' products in their projects. Sigma Software's team is always ready to implement innovative solutions that expand their clients' businesses and ensure growth.

These are just some of the reasons why you should take a closer look at Ukraine. There you can find fantastic open-minded people willing to create the next big thing as well as an IT partner company that will eventually emerge as your strategic tech partner.

Sigma Software is ready to be your reliable and trusted guide to this promising market.

HOW TO REACH YOUR TECH-RELATED BUSINESS GOALS?

sigma Software

Are you an enterprise? — **Y** → Need guidance? — **Y** → **You need IT consulting**

Digital transformation needed? — **Y** → Need guidance?

Are you a product house? — **N** → Need a tech solution?

Need a tech solution? — **Y** → **N** → **You need IT consulting**

Need to scale delivery capacity? — **Y** → Have an in-house team?

Are you a startup? — **Y** → Have an in-house team? — **N** → **You need a dedicated team**

You need a team extention

YOU NEED A RELIABLE TECH PARTNER

Sigma Software is a team of 1,100+ IT experts in Sweden, the US, Poland, and Ukraine. We love finding smart solutions to our customer's business challenges & needs, and have been successfully doing so since 2002. We create additional value for ou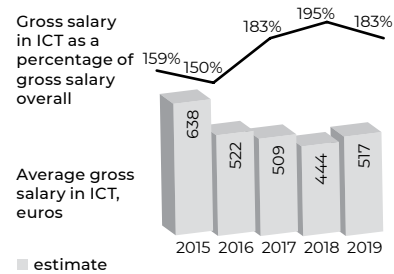r customers and reduce their costs by using our own engineering platforms and by integrating 20+ partners' products in their projects. The Company is a part of a leading Scandinavian technology-consulting group and one of the world's TOP100 outsourcing companies. Sigma Software is among the TOP B2B companies according to Clutch.
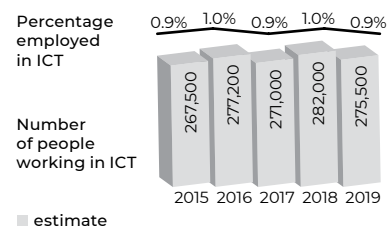
CENTRAL ASIA

OVERVIEW

Population (million)	Labour force	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2019 (%)	Inward FDI (millions, euros)
74.317	31,800,000	267,053	3,593	328%	7,139

ICT GROSS SALARY IN 2015-21

Gross salary in ICT as a percentage of gross salary overall

159% 150% 183% 195% 183%

Average gross salary in ICT, euros

638 522 509 444 517

2015 2016 2017 2018 2019

■ estimate

ICT EMPLOYMENT IN 2015-21

Percentage employed in ICT

0.9% 1.0% 0.9% 1.0% 0.9%

Number of people working in ICT

267,500 277,200 271,000 282,000 275,500

2015 2016 2017 2018 2019

■ estimate

The five countries of Central Asia retain a strong Russian influence, from their histories as part of the Russian Empire and later the Soviet Union. However, in recent years, some of these countries have been pivoting away from Russia in favour of China, or taking a more independent path. One way of asserting this independence is through developing the local ICT industry.

All five countries are ranked relatively low in the EF English Proficiency Index. Uzbekistan scores best (88th position) while Tajikistan is ranked 100th — the lowest both in the region and globally.

Kazakhstan is the largest Central Asian country by size and the most developed as shown by the Human Development Index. For the past decade, Kazakhstan's government has been trying to wean the country off of its economic dependence on oil by investing in the ICT industry. The policy aims to develop digital technologies in key sectors, expanding infrastructure, creating favourable conditions for entrepreneurs through active assistance in the development of e-commerce and increasing the overall digital literacy of the population, which will contribute to the development of the domestic IT sector, as well as improve the quality of education and healthcare in Kazakhstan.

Since 2010, Kazakhstan's percentage of internet users has shot up from 30 per cent to over 80 per cent. More than 97 per cent of the population is estimated to be fluent in Russian.

In 2017, the government launched the **Digital Kazakhstan** Initiative whose goals include digitising the economy, transitioning to e-governance, developing ICT infrastructure and stepping up ICT education in primary and secondary schools.

In 2019, there were **161,750 specialists employed** in ICT sector, 1.8 per cent of total employment in the economy. The average monthly nominal wage in the sector equals 612 euros, which accounts for 140 per cent of average salary in the economy.

The export of ICT services amounted to **116 million euros**, which makes up only 0.07 per cent of the GDP.

Kyrgyzstan is territorially the smallest country in Central Asia. While the country has lagged behind its regional neighbours in ICT access and digital infrastructure

development, it is nevertheless one of the fastest growing industries in the Kyrgyz Republic.

In 2011, the Kyrgyz government launched a high-tech park, modelled on the High Technology Park in Belarus. It is a tax-free economic zone oriented towards promoting exported IT services and products to overseas clients. By the end of 2019, the parks' residents generated **14 million US dollars** in annual total revenue, a 65 per cent increase from 2018.

Nearly 30 per cent of software and other IT exports go to the United States, while the remainder reach over 30 other markets including Japan, Canada, Ukraine, Kazakhstan, India, and Germany. By 2024, the park is expected to generate 200 million US dollars in annual aggregate revenue and employ up to **10,000 people in IT-related jobs**.

Despite the dynamic development of the Kyrgyz IT sector, a key barrier to the expansion of the IT sector is the lack of trained IT specialists and attrition of talented Kyrgyz developers to overseas employers. In the last six years, the Kyrgyz Republic has risen in the rankings of the Global Innovation Index from 117th in 2013 to 90th in 2019 among 129 countries, outperforming Uzbekistan, Tajikistan, and Turkmenistan in innovation digital adoption activities.

In 2019, similar to Kazakhstan, the Kyrgyz government adopted a **Digital Kyrgyzstan 2019-2023 strategy**, which aims to improve digital infrastructure and digital literacy, and digitise the banking and financial sectors.

Tajikistan is another country which could benefit from developing its ICT industry. A landlocked mountainous country with few natural resources, it has a 70 per cent fluency rate in Russian as a foundation to develop the industry.
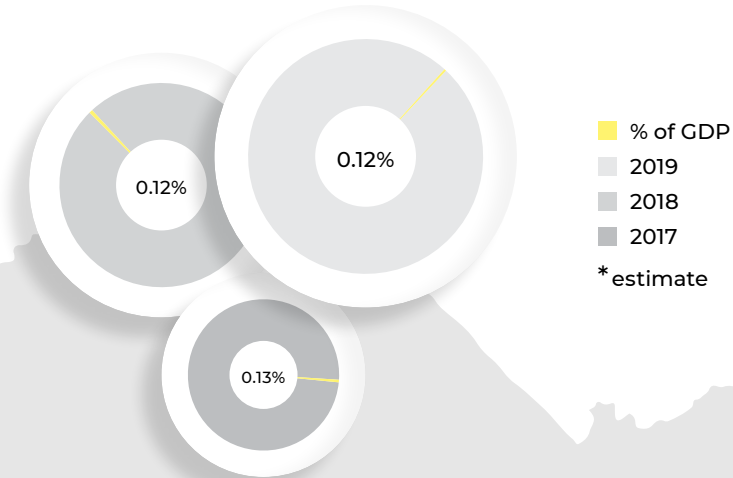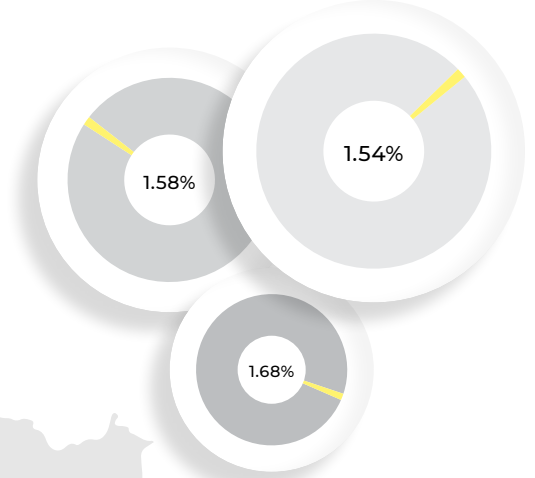
However, it remains underdeveloped. Tajikistan offers relatively expensive internet, of which only 20 per cent of the population has access to. However, there are some success stories, like fintech start-up Alif Sarmoya, founded by Tajiks studying in the US, which now employs some 250 people and has revolutionised Tajikistan's banking system. This sets a good precedent for the development of the industry, although the government should play a more active role in supporting it.

According to the Tajik Agency of Statistics, the **average salary in ICT amounted to 244 euros** in 2019.

Turkmenistan has the smallest population of the Central Asian states, despite covering a fairly large territory. Although steadily rising, the rate of internet access remains at just 21 per cent, hampering development. Furthermore, the lack of democratic processes isolates the country from the rest of the world, again limiting the development of the ICT industry.

Despite this, it has been building closer ties with Turkey to develop the industry and in 2019 launched the Concept for Development of a **Digital Economy**, which aims to increase business and investment

opportunities, modernise and digitise the economy and develop e-governance capabilities.

Uzbekistan has by far the largest population in Central Asia, of which over 50 per cent has internet access. Uzbekistan recently published its **Digital Strategy 2030**, outlining the goals the country aims to achieve to accelerate its digital readiness. Improved digital infrastructure and the adoption of digital solutions across industries will support Uzbekistan in its efforts to diversify its economy away from commodity exports. Despite the government's commitment, we are of the view that attracting private investment will be vital to a successful implementation of the strategy. However, risks remain for private investors, especially in relation to corruption and cybersecurity.

Throughout the next decade, Uzbekistan will seek to power its digital transformation and achieve the goals set out in its digital strategy, which include increasing internet access for the population, improving IT literacy and the digital skills of the local workforce, developing e-government services, expanding the country's open data portal and investing in cloud infrastructure.

In 2017, the government inaugurated the Mirzo Ulugbek Innovation Centre, which has some 200 resident ICT companies. The **first IT Park in Uzbekistan** was opened in Tashkent in mid-2019.

As with the other Central Asian countries, Uzbekistan has a population proficient in Russian, as well as a significant part of the population currently learning English and Turkish.

According to the International Labour Organisation, there are **62,200 people employed in the sector**, which accounts for 0.5 per cent of all people employed in the economy. The figure has remained stable since 2015. According to the country's Statistical Committee, in 2019, the **average gross salary in ICT amounted to 383 euros**. Due to the instability of currency rates, the average salary in ICT changes significantly year to year (483 euros in 2014, 623 euros in 2016, 319 euros in 2018 and 383 euros in 2019).

In 2019, the **export of ICT services was worth 147.8 million euros**, of which only 6.2 million euros accounted for computer services. The ICT value added accounted for 1.44 per cent of GDP and fell from 1.87 per cent in 2017.

ICT EXPORTS*

0.12% 0.12% 0.13%

ICT VALUE ADDED*

1.54% 1.58% 1.68%

■ % of GDP
■ 2019
■ 2018
■ 2017

*estimate

EXPORTS

|	2015*	2016*	2017*	2018*	2019*
ICT services (millions, euros)	410.4	370.6	312.4	291.9	309.2
of which **computer services** (millions, euros)	21.8	22.0	22.8	28.2	35.7

*estimate

FDI DESTINATIONS

A 12-month subscription to FDI Destinations includes:

- **1 city multimedia profile** on Emerging Europe, featuring key facts, videos, investment guides, links to content about your city and contact details to your representatives.
- **2 articles about your city** published on Emerging Europe, authored by your experts, and showcasing your thought leadership and investment attractiveness.
- **6 live interactive sessions** with leading location promotion experts
- Full access to Emerging Europe's **closed FDI Destinations social media groups**

CLICK TO FIND OUT MORE

emerging-europe.com/fdi-destinations
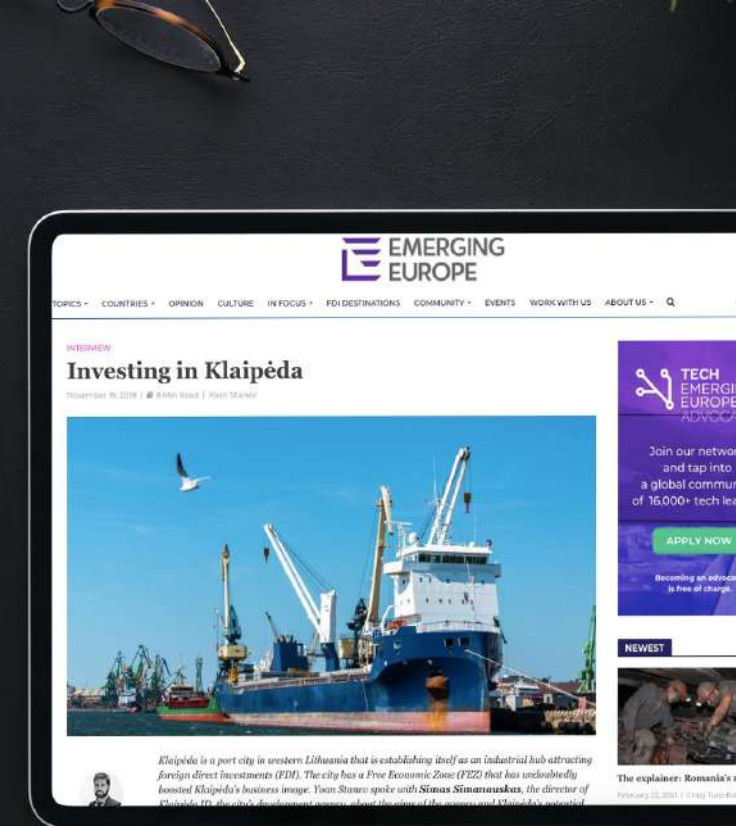
ADDITIONAL RESOURCES
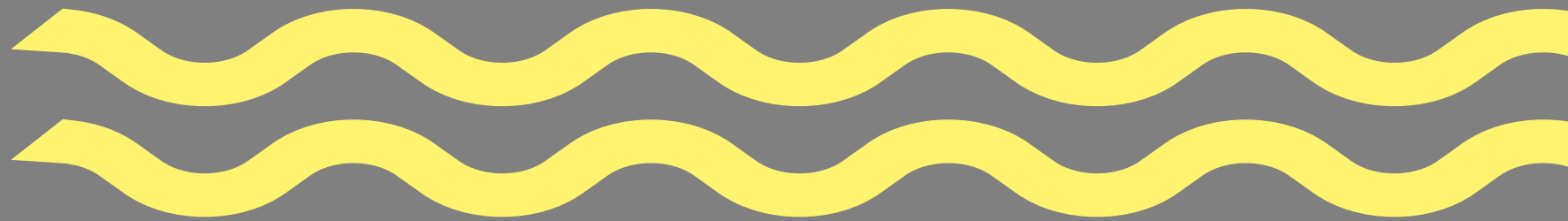
TECHNOLOGY ECOSYSTEM

This is a non-exhaustive list of supporting organisations in the emerging Europe region. If you'd like to add your organisation to the next edition of *The IT Landscape: Future of IT report*, contact us at research@emerging-europe.com.

Albania
Albanian Business Services Association
Albanian ICT Association
Albanian Innovation Accelerator
Business Incubator Korca
CEED Albania
IDEA
Protik Innovation Centre
UK-Albania TechHub
Uplift Start-up Accelerator Programme Albania
Yunus

Armenia
Catalyst Hi-Tech and Entrepreneurship Development Foundation
Enterprise Incubator Foundation
Start-Up Armenia Foundation
Union of Advanced Technology Enterprises of Armenia (UATE)
Union of Employers of Information and Communication Technologies

Azerbaijan
Azerbaijani National Academy of Sciences — Institute of Information Technology
Founder Institute Azerbaijan Start-Up Accelerator
NEXT STEP Innovation Centre

Belarus
Belarus Hi-Tech Park
Imaguru
Scientific and Technological Association "Infopark"
Tech Minsk

Bosnia and Herzegovina
Beezone
Bit Alliance
Fondacija Mozaik
HUB387
Intera Technology Park
Linnovate
QLab

Bulgaria
Association of the Bulgarian Leaders and Entrepreneurs (ABLE)

Bulgarian Association of Software Companies (BASSCOM)
Bulgarian Association of Information Technologies (BAIT)
Bulgarian Centre of Women in Technology (BCWT)
Bulgarian Entrepreneurship Centre
Bulgarian Private Equity and Venture Capital Association (BVCA)
Bulgarian Start-up Association (BESCO)
Data Science Society
Economic Development via Innovation and Technology (EDIT)
ICT Cluster Plovdiv
Law and Internet Foundation
Microsoft Innovation Centre Bulgaria
Sofia Tech Park
Start it Smart
Start-up Factory
Start-up Foundation

Croatia
BIOS Incubator Osijek
Croatian Information Technology Association (CITA)
HUB385
Impact Hub Zagreb
PISMO Incubator Novska
Start-up Incubator Rijeka
Zagreb Innovation Centre
ZIP — Zagreb Entrepreneurship Incubator

Czechia
Association for Information Technologies and Telecommunications (ICTU)
Czech IT Cluster
Czech Technology Park Brno
DEX Innovation Centre
StartUpYard
Green Light
UP21
Impact Hub
Prague IoT Centre
ESA Business Incubation Centres
Information Technology and Telecommunication Association (AITAT)
Science and Technology Park Pilsen
SIC South Moravian Innovation Centre
Technology Park of Information and Communication Technology in Zlín

Egypt
AUC Venture Labs
Egyptian Information, Telecommunications, Electronics and Software Alliance (EITESAL)
Endeavor Egypt
Flat6Labs
Information Technology Industry Development Agency (ITIDA)
INJAZ Egypt
Maadi Technology Park

Estonia
Ajujaht
Buildit Accelerator
ClimateLaunchpad
e-Estonia
Elevator Startup Labs
Estonian Association of Information Technology and Telecommunications (ITL)
GameFounders
Start-up Estonia
Start-up Wise Guys
Tallinn Science Park Tehnopol
TalTech Mektory
Tartu Biotechnology Park
Tehnopol Start-up Incubator
VUNK Start-up Labs

Georgia
Georgian ICT Association
Georgian Innovation and Technology Agency (GITA)
Georgian IT Cluster

Hungary
Alliance Informatics and Innovation Cluster
Association of Hungarian IT Companies (IVSZ)
Hungarian Service and Outsourcing Association (HOA)
ICT Association of Hungary

Kazakhstan
Almaty Tech Garden
Altay Technopark
Association of IT Companies of Kazakhstan (ITK)
iStartUp
National Agency for Technological Development
Start-Up Kazakhstan

Kosovo
Innovation Centre Kosovo
Kosovo Association of Information and Communications Technology (STIKK)
Technology Park in Shtime

Kyrgyzstan
High–Technology Park of the Kyrgyz Republic (HTP)
Kyrgyz Software and Service Developers Association

Latvia
Latvia Technology Park
Latvian Information and communications technology association (LIKTA)
Latvian IT Cluster
Start-Up Latvia

Lithuania
Association of the information technology, telecommunications and office
equipment companies of Lithuania (INFOBALT)

Digital Rocket LT Cluster
Fintech Lithuania Cluster
Kaunas' Science and Technology Park
Klaipėda's Science and Technology Park
Vilnius' Sunrise Valley Science and Technology Park

Moldova
Moldova IT Park
Moldovan Association of Private ICT Companies (ATIC)
Tekwill

Montenegro
ICT Cortex
Montenegrin Business Angel Network (MeBAN)
Montenegrin IT Cluster
Science and Technology Park of Montenegro
Tehnopolis

North Macedonia
Bitoal Acceleration Programme
Fund for Innovation and Technology Development
ICT Chamber of Commerce of Republic of North Macedonia (MASIT)
Seavus Accelerator
SEEUTechPark
Skopje Technology Park
Startup Macedonia
Technology Park SEEU Tetovo
UKIM Accelerator
X Factor Accelerator

Poland
AIP Link
Aspire — Association of IT and Business Services Companies
Association of Business Service Leaders (ABSL)
Bialystok Science and Technology Park
Bydgoszcz IT Cluster
Cambridge Innovation Centre
Cracow Technology Park
Entrepreneurial Poland Foundation
FundingBox Accelerator
Gdański Starter
Huge Thing Accelerator
HugeTECH Accelerator
ICT West Pomerania Cluster
Inkubator Technologiczny Samsung
Lublin Science and Technology Park
Mazovia Cluster ICT
National Capital Fund (KFK)
National Centre for Research and Development (NCBR)
Polish Agency for Enterprise Development (PARP)
Polish Chamber of Information Technology and Telecommunications
Polish Development Fund (PFR)

Polish Games Association
Poznan Science and Technology Park (PSTP)
ProProgressio
ReaktorX
Silesia ICT Cluster
Start-up Spark — Lodz Special Economic Zone
Start-Up Spark Accelerator
Wielkopolska ICT Cluster

Romania
Association for Information Technology and Communications of Romania (ATIC)
Cluj IT Cluster
Different Angle Cluster
HIT Park (Hemeiuș Information Technology)
ICT Oltenia Cluster
Innovation Labs
IT&C Cluster Lower Danube
IXperiment
Liberty Technology Park Cluj
Romanian Software Industry Association (ANIS)
Romanian Start-ups
 Romanian IT
 Blockchain Association
Startarium
Transilvania IT Cluster

Serbia
Digital Serbia Initiative
ICT Cluster of Central Serbia
NiCAT Cluster
Science and Technology Park Niš
Science Technology Park Belgrade
Science Technology Park Cacak
Serbian Blockchain Initiative
Serbian Games Association
Union of ICT Societies of Serbia (JISA)
Vojvodina ICT Cluster – VOICT

Slovakia
IT Association of Slovakia (ITAS)
Košice IT Valley
Launcher Start-up and Innovation Studio
Slovak Alliance for Innovative Economy (SAPIE)
Slovensko Digital
Startup center TUKE
Young Entrepreneurs Association of Slovakia (YEAS)

Slovenia
ABC Accelerator
Katapult
Ljubljana University Incubator
Mladi podjetnik

Slovene Enterprise Fund
Slovenian Business Angels Slovenian Business Angels
Startaj.si
Start-Up Slovenia
Technology Park Ljubljana
Tovarna Podjemov – Start:up Slovenia

Tajikistan
Centre of Information–Communication Technologies
Technological park of Tajik Technical University
Turkmenistan
Turkmen IT Park

Ukraine
1991 Open Data Incubator
Diia.City
GrowthUP
IT Dnipro
IT Ukraine Association
Kharkiv IT Cluster
Kyiv IT Cluster
Lviv IT Cluster
LvivTech.City
Odessa IT Cluster
Sector X
Tech Ukraine
The Ukrainian Association of FinTech and Innovation Companies
Ukrainian Internet Association
Ukrainian Venture Capital and Private Equity Association (UVCA)
UNIT.City
W.tech

Uzbekistan
Centre for Advanced Technology
IT Park Uzbekistan
Start-Up Factory
Tech4Impact
Uzbekistan Venture Capital Association

METHODOLOGY

The research covers 29 countries:

1. 23 countries of the emerging Europe region ('**Emerging Europe**'):

I. six countries of the **South East Europe** region – Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, Serbia;

II. three countries of the **North East Europe** region – Estonia, Latvia, Lithuania;

III. eight countries of the **Central Europe** region – Bulgaria, Croatia, Czechia, Hungary, Poland, Romania, Slovakia, Slovenia;

IV. six countries of the **Eastern Europe** region – Armenia, Azerbaijan, Belarus, Georgia, Moldova, Ukraine;

2. five countries of the **Central Asia** region: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan;

3. Egypt.

DEFINITIONS OF THE CONCEPTS USED IN THE RESEARCH

Average salary in the economy – average gross salary, average gross wage, average gross earnings or average nominal wages in the economy.

ICT gross salary – average gross salary, average gross wage, average gross earning or average nominal wages in NACE Rev. 2 section J 'Information and communication'. The terms 'average salary in ICT', 'average ICT salary', 'average wage in ICT' are used interchangeably and characterise the abovementioned concept.

Labour data are collected according to the Labour Force Survey data (according to the methodology of the International Labour Organisation). This approach refers to the data of the number of employed persons, number of unemployed persons, number of economically active persons / labour force, number of persons employed by the sector or field of the economy.

Average regional ICT salary is calculated as weighted average of average gross ICT salaries in the individual economies considering the number of persons employed in ICT in the individual economies.

Labour force refers to the sum of employed and unemployed persons.

Average salary in ICT as percentage of GDP per capita is calculated by dividing the average gross salary in ICT in the individual economy by the GDP per capita of the respective country.

Number of people working in ICT – number of persons employed in NACE Rev.2 section J 'Information and communication'. The terms 'number of people working in ICT', 'number of persons employed in ICT', 'ICT employment', 'number of IT specialists' and 'number of ICT professionals' are used interchangeably and characterise the abovementioned concept.

Number of ICT specialists per 100,000 of population is calculated by dividing the number of people working in ICT by population and multiplied by 100,000.

ICT value added refers to the value added of NACE Rev. 2 section J 'Information and communication' in current prices used in the gross domestic product calculation by production approach. Data in the local currency are converted to euros using the official exchange rate of the central bank of the respective country in the respective year. Data in US dollars are converted to euros using the cross rate based on the official exchange rate of the local currency to US dollars

and euros of the central bank of the respective country in the respective year.

ICT value added as percentage of GDP is calculated by dividing to the value added of NACE Rev. 2 section J 'Information and communication' in current prices by the GDP in current prices.

Export of ICT services refers to the export of 'Telecommunications, computer and information services' (component 9 according to EBOPS 2010) and is a sum of 'Telecommunication services' (EBOPS 2010 code 9.1) export, 'Computer services' (EBOPS 2010 code 9.2) export and 'Information services' (EBOPS 2010 code 9.3) export. The Balances of Payments of the countries and the International Trade Center database are the sources of the statistics. Data from the ITC database are used in USD and converted to euros using the official exchange rate of the central bank of the respective country in the respective year. The terms 'export of ICT services', 'ICT export', 'ICT exports' are used interchangeably.

Export of computer services refers to the export of 'Computer services' (EBOPS 2010 code 9.2).

Export of ICT services as percentage of GDP is calculated by dividing the export of ICT services by the GDP in current prices.

Population refers to the resident population at the end of the year. Bosnia and Herzegovina's population refers to the mid-year present population.

GDP nominal refers to the gross domestic product in current prices. Calculation based on the gross domestic product in local currency divided by the official average exchange rate of the local currency unit to the euro in the respective year. In case of calculation based on US dollars, the cross rate of the USD to euros is used based on the official average exchange rates of the local currency to the US dollar and the euro.

GDP per capita is calculated by dividing the nominal GDP by the population of the country.

GDP change 2000-2019 is calculated as the difference between the gross domestic product in international dollars (converted using purchase power parity rates) in percentages. The source of the data is the World Bank database.

Inward FDI refers to the value of inflows of foreign direct investments in 2019. The source of the data is the UNCTAD database. Kosovo's inward FDI figure is based on the data from the Central Bank of the Republic of Kosovo. Data in US dollars are converted to euros using the cross rate based on the official exchange rate of local currency to US dollars and euros of the central bank of the respective country in the respective year.

Number of ICT students refers to the number of students in the field 06 'Information and Communication Technologies' according to the International Standard Classification of Education (ISCED Fields of Education and Training (ISCED-F) 2013) (levels 5-8 according to ISCED 2011). The figure for respective year reflects the numbers as of the start of academic year, that started in the respective year. The sources are the data from the national statistical authorities and the Eurostat database.

Number of ICT students per 100,000 of population is calculated by dividing the number of students in the field 06 'Information and Communication Technologies' by population and multiplied by 100,000.

Number of ICT graduates refers to the number of graduates in the field 06 'Information and Communication Technologies' according to the International Standard Classification of Education (ISCED Fields of Education and Training (ISCED-F) 2013) (levels 5-8 according to ISCED 2011). The sources are the data from the national statistical authorities and the Eurostat database.

Number of ICT graduates per 100,000 of population is calculated by dividing the number of graduates in the field 06 'Information and Communication Technologies' by population and multiplied by 100,000.

Number of bachelor and short-term students/ graduates refers to the number of students/graduates in the 5th and 6th level of education according to the International Standard Classification of Education (ISCED) 2011.

Number of master's and doctoral students/ graduates refers to the number of students/graduates in the 7th and 8th level of education according to the International Standard Classification of Education (ISCED) 2011.

NOTES

Missing figures are modelled for the regional overview based on the annual change of parameter in the available years.

Number of ICT students per 100,000 of population and number of ICT graduates per 100,000 of population in the regional overview section represents the latest available data. The figure for the whole region is for 2019 and based on factual and modelled figures.

In case of a break in series due to changes in the national methodology data were adjusted. In case of changes related to the change in taxes or contributions that affected the gross wage no adjustments were made.

Forecasts that are included in the country profiles are based on available information for 2020 and our own analysis.

Data that are included in the profile of Central Asia are based on available information about the countries of the region, which means that the figures may not represent the average or sum of all the countries.

IT COMPETITIVENESS INDEX METHODOLOGY

The IT Competitiveness Index consists of three sections:

1. Talent – 60 per cent, which is composed of 16 elements:

A - Number of people working in ICT. Based on the data for 2019. Weight: 7 per cent.

B - Number of people working in ICT per 100,000 people. Based on the data for 2019. Weight: 5 per cent.

C - Annual growth of the number of people working in ICT per 100,000 people. Based on the data for 2019. Weight: 5 per cent.

D - Average salary in ICT. Based on the data for 2019. Weight: 8 per cent.

E - Average annual growth of average salary in ICT as a percentage of the average regional ICT salary. Based on the calculation of average gross salary in ICT in the economy divided by the average gross regional ICT salary, and annual change of that parameter between 2015 and 2019. Annual change figures between the years that are not representative due to regulatory changes were excluded from the calculation. Weight: 7 per cent.

F – EF English Proficiency Index rank. The EF EPI ranking for 2020 was used. The number of points assigned to Slovenia is based on the analysis of the result in the 2018 ranking. The number of points assigned to Bosnia and Herzegovina is based on the analysis of the result in the 2016 ranking. Weight: 6 per cent.

G – International Mathematical Olympiad place. Based on the data for 2020. In case of Egypt the figure is based on the data for 2019. Weight: 3 per cent.

H - PISA Mathematics rank. Based on the data for 2018. Weight: 3 per cent.

I - Number of ICT students. Based on the latest available data. Data for 2017 are used for Czechia, Croatia, North Macedonia, Slovakia. Data for 2019 are used for the rest of the countries. Weight: 2 per cent.

J - Annual growth of the number of ICT students. Based on the average annual change of parameter between 2015 and 2017 for Czechia, Croatia, North Macedonia, Slovakia; between 2016 and 2019 for Armenia; between 2017 and 2019 for Moldova; between 2015 and 2019 for the rest of the countries. Weight: 2 per cent.

K - Number of ICT graduates. Data for 2018 are used for Albania, Croatia, Czechia, North Macedonia, Romania, Slovakia. Data for 2019 are used for the rest of the countries. Weight: 2 per cent.

L - Annual growth of the number of ICT graduates. Based on the average annual change of parameter between 2015 and 2018 for Albania, Croatia, Czechia, North Macedonia, Romania, Slovakia; between 2016 and 2019 for Armenia; between 2017 and 2019 for Moldova; between 2015 and 2019 for the rest of the countries. Weight: 2 per cent.

M - Number of ICT students per 100,000 people. Based on the latest available year for the data on number of ICT students. Weight: 2 per cent.

N - Annual growth of the number of ICT students per 100,000 people. Based on the average annual change of parameter between 2015 and 2017 for Czechia, Croatia, North Macedonia, Slovakia; between 2016 and 2019 for Armenia; between 2017 and 2019 for Moldova; between 2015 and 2019 for the rest of the countries. Weight: 2 per cent.

O - Number of ICT graduates per 100,000 people. Based on the latest available

year for the data on number of ICT students. Weight: 2 per cent.

P - Annual growth of the number of ICT graduates per 100,000 people. Based on the average annual change of parameter between 2015 and 2018 for Albania, Croatia, Czechia, North Macedonia, Romania, Slovakia; between 2016 and 2019 for Armenia; between 2017 and 2019 for Moldova; between 2015 and 2019 for the rest of the countries. Weight: 2 per cent.

2. Sector – 25 per cent, which is composed of 4 elements:

V - Value added of ICT. Based on the data for 2018 for Albania. Based on the data for 2019 for the rest of the countries. Weight: 7.5 per cent.

W - Value added of ICT per capita. Parameter is calculated by dividing the value added of ICT by the population of the country. Based on the data for 2018 for Albania. Based on the data for 2019 for the rest of the countries. Weight: 7.5 per cent.

X - Export of ICT services. Based on the data for 2019. Weight: 5 per cent.

Y - Export of ICT services per capita. Parameter is calculated by dividing the value of ICT export by the population of the country. Weight: 5 per cent.

3. Business climate – 15 per cent, which is composed of 5 elements:

Q - Ease of Doing Business rank. Based on the data from the Doing Business 2020 report. Weight: 3 per cent.

R - Index of Economic Freedom rank. Based on the 2020 Index of Economic Freedom ranking. Weight: 3 per cent.

S - Social Progress Index rank. Based on the 2020 Social Progress Index ranking. Weight: 3 per cent.

T - Human Development Index rank. Based on the 2020 Human Development Index ranking. Weight: 3 per cent.

U - Corruption Perception Index rank. Based on the 2020 Corruption Perception Index ranking. Weight: 3 per cent.

If the figure is unavailable due to the absence of the country in rankings, the weighted average figure for other components within the section is applied.

Countries are assigned between 10.00 and 100.00 points for each parameter. 10.00 points are assigned to the country which has the worth figure in the region, 100.00 points are assigned to the country which has the best figure in the region.

Calculation for the parameters A, B, C, I, J, K, L, M, N, O, P, V, W, X, Y is done using the following formula:

$$Points = \left(10 + \frac{Value - Min\ value}{Max\ value\ - Min\ value} * 90\right) * Weight$$

where:
Max value – the highest figure in the region;
Min value – the lowest figure in the region;
Weight – weight of the parameter.
Calculation for the parameters D and E is done using the following formula:

$$Points = \left(100 - \frac{Value - Min\ value}{Max\ value\ - Min\ value} * 90\right) * Weight$$

where:
Max value – the highest figure in the region;
Min value – the lowest figure in the region;
Weight – weight of the parameter.
Parameters F, G, H, Q, R, S, T, U are rankings, so the following methodology is used:

1. Country with the highest rank in the region is assigned 100 points.
2. Country with the 8th rank in the region is assigned 70 points.
3. Country with the 15th rank in the region is assigned 40 points.
4. Country with the 23rd rank in the region is assigned 10 points.
For the countries from the 1st to 8th position number of points is calculated as following:

$$Points_1 = \left(100 - \frac{Value - Min\ value_1}{Max\ value_1 - Min\ value_1} * 30\right) * Weight$$

where:
Max value1 - lowest rank in the first group of countries;
Min value1 - highest rank in the first group of countries;
Weight – weight of the parameter.
For the countries from the 9th to 15th position number of points is calculated as following:

$$Points_2 = \left(70 - \frac{Value - Min\ value_2}{Max\ value_2 - Min\ value_2} * 30\right) * Weight$$

where:
Max value2 - lowest rank in the second group of countries;
Min value2 - highest rank in the second group of countries;
Weight – weight of the parameter.
For the countries from the 16th to 23rd position number of points is calculated as following:

$$Points_3 = \left(40 - \frac{Value - Min\ value_3}{Max\ value_3 - Min\ value_3} * 30\right) * Weight$$

where:
Max value3 - lowest rank in the third group of countries;
Min value3 - highest rank in the third group of countries;
Weight – weight of the parameter.
For the calculation of the number of points for Egypt the same methodology was used, based on the thresholds used for the countries from the emerging Europe region. In case the country scores more than 100 points, then 100 points are assigned. If Egypt scores less than 10 points, 10 points are assigned.

CLUTCH TOP PROVIDERS

The rankings are based on the Clutch Leaders Matrix and retrieved in December 2020.

REFERENCES AND SOURCES

PRIMARY SOURCES

Agency for Control and Quality Assurance of Higher Education of Montenegro

Agency for Statistics of Bosnia and Herzegovina

Agency on Statistics under President of the Republic of Tajikistan

Bank of Albania

Bank of Latvia

Bank of Lithuania

Bank of Slovenia

Bulgarian National Bank

Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan

Central Agency for Public Mobilisation and Statistics of Egypt

Central Bank of Bosnia and Herzegovina

Central Bank of Montenegro

Central Bank of the Republic of Kosovo

Central Statistical Bureau of Latvia

Central Statistical Office of Poland

Croatian Bureau of Statistics

Croatian National Bank

Czech Statistical Office

Czech National Bank

DATAcube Database (Slovakia)

Education Management Information System of Georgia

Eesti Pank

Estonian Ministry of Education and Research

HdridusSilm

Hungarian Central Statistical Office

Hungarian National Bank

Institute of Statistics of the Republic of Albania (INSTAT)

Kosovo Agency of Statistics

Lithuanian Department of Statistics (Statistics Lithuania)

Ministry of Education, Science and Sport of the Republic of Lithuania

Ministry for Innovation and Technology (Hungary)

Ministry of Communications and Information Technology of the Arab Republic of Egypt

Ministry of Economics of the Republic of Latvia

Ministry of Economy and Infrastructure of the Republic of Moldova

Ministry of Education and Science of the Republic of Latvia

Ministry of Education of Azerbaijan

Ministry of Education of the Republic of Armenia

Ministry of Education, Science and Sport of the Republic of Slovenia

Ministry of Education, Youth and Sports (Czechia)

Ministry of Finance of the Republic of Estonia

Ministry of Finance of the Republic of Lithuania

Ministry of Science and Higher Education of the Republic of Poland

National Bank of Slovakia

National bank of Poland

National Bank for Foreign Economic Affairs of the Republic of Uzbekistan

National Bank of Georgia

National Bank of Moldova

National Bank of Romania

National Bank of Serbia

National Bank of Tajikistan

National Bank of the Kyrgyz Republic

National Bank of the Republic of Belarus

National Bank of the Republic of Kazakhstan

National Bank of the Republic of North Macedonia

National Bank of Ukraine

National Bank of Egypt

National Bureau of Statistics of the Republic of Moldova

National Institute of Statistics of Romania

National Statistical Committee of the Kyrgyz Republic

National Statistical Committee of the Republic of Belarus

National Statistics Office of Georgia

National Statistical Institute of the Republic of Bulgaria

Office of the Prime Minister of Albania

Slovak Centre of Scientific and Technical Information

State Committee of the Republic of Uzbekistan on Statistics

State Statistical Committee of the Republic of Azerbaijan

State Statistical Office of the Republic of North Macedonia

State Statistics Service of Ukraine

Statistical Committee of the Republic of Armenia

Statistical Office of Montenegro (MONSTAT)

Statistical Office of the Republic of Slovenia

Statistical Office of the Republic of Serbia

Statistical Office of the Slovak Republic

Statistics Estonia

REFERENCES AND SOURCES

SECONDARY SOURCES

African Business

Agenda Georgia

Albanian Business Services Association

Albanian Investment Development Agency

Armenian Weekly

Asian Development Bank

Astana Times

Atlantic Council

Atomico – State of European Tech

Automotive News Europe

Azerbaijan Export and Investment Promotion Foundation

Balkan Insight

Baltic Times

Bit Alliance

Bloomberg News

Caucasus Business Week

CEE Legal Matters

CIS Legislation

CNBC

Croatia Week

Czech Invest: Investment and Business Development Agency

Deloitte

Development Agency of Serbia

Digital Kazakhstan

Digital TV Europe

Economist Intelligence Unit

EE Times India

E-Estonia

EF English Proficiency Index

Enterprise Incubator Foundation

Eurasianet

European Bank for Reconstruction and Development

European Investment Bank

European Commission

Eurostat

Ernst & Young

Financial Times

Forbes

Foreign Investment Promotion Agency of Bosnia and Herzegovina

Foreign Policy

Future of Life Institute

Georgia Today

Georgian National Investment Agency

German Corporation for International Cooperation (GIZ)

German Outsourcing Association

Global Sourcing Association

Go Vilnius

Heritage Foundation

Hungarian Investment Promotion Agency

IBM

India Times

Information Technology Industry Development Agency (Egypt)

International Association of Outsourcing Professionals

International Centre for Defense and Security

International Federation of Robotics

International Mathematical Olympiad

International Monetary Fund

International Telecommunication Union

International Trade Centre — TradeMap

Invest Lithuania

Invest Romania

Invest Slovenia

Invest Bulgaria Agency

Investment and Development Agency of Latvia

Irish Times

Klaster Lithuania

Kosovo Investment and Enterprise Support Agency

KPMG

Labs of Latvia

McKinsey & Company

Moldovan Association of ICT Companies

Mondaq

NASDAQ

National Agency of Investment and Privatisation

National Alliance for Local Economic Development

Netherlands Enterprise Agency

Netokracija

Nordea

OECD — Organisation for Economic Co-operation and Development

OECD — Organisation for Economic Co-operation and Development — Programme

for International Student Assessment

Oxford Business Group

Poland In

Polish Investment and Trade Agency

Politico

Postnord

PR Legal

Prague Post

President of the Republic of Azerbaijan

PricewaterhouseCoopers

Raifeissen Bank

Reuters

Romania Insider

Sifted

Slovak Investment and Trade Development Agency

Slovakia Tech

Social Progress Imperative

Speedtest Global Index – Ookla

Stackoverflow

Startup Blink

Startup Poland

Statista

TechCrunch

Topcoder

Transparency International

UiPath

Ukraine Digital News

Ukraine Invest

Ukrinform

UNCTAD — United Nations Conference on Trade and Development

UNDP — United Nations Development Programme

UNEP — United Nations Environment Programme

United Nations Conference on Trade and Development – UNCTADstat

United Nations Educational, Scientific and Cultural Organisation database

United States Department of Commerce

University of Central Asia

University of Pennsylvania

Vienna Institute for International Economic Studies

Visegrad Group

World Bank

World Movement for Democracy

World Trade Organisation

ZDNet

Emerging Europe's own news site and previous reports and analyses

ABBRIVIATIONS AND ACRONYMS

BiH – Bosnia and Herzegovina

BPM5 – Fifth Edition of the Balance of Payments Manual

BPM6 – Sixth Edition of the Balance of Payments and International Investment Position Manual

BPO – Business Process Outsourcing

DESI – Digital Economy and Society Index

EBOPS – Extended Balance of Payments Services Classification

EF EPI – EF English Proficiency Index

EMEA – Europe, the Middle East and Africa

EU – European Union

FDI – Foreign Direct Investment

GDP – Gross Domestic Product

GITA – Georgian Innovation and Technology Agency

HDI – Human Development Index

HTP – High–Tech Park

ICT – Information and Communications Technology

IDC – International Data Corporation

ILO – International Labour Organisation

IMF – International Monetary Fund

IMO – International Mathematical Olympiad

ISCED – International Standard Classification of Education

IT – Information Technology

ITO – Information Technology Outsourcing

ITC – International Trade Centre

KPO – Knowledge Process Outsourcing

MBAN – Montenegrin Business Angels Network

Mbps – Megabits per second

NACE – European Classification of Economic Activities

NATO – North Atlantic Treaty Organisation

NGO – Non-Governmental Organisation

OECD – Organisation for Economic Co-operation and Development

PISA – Programme for International Student Assessment

R&D – Research and Development

SaaS – Software as a Service

STEM – Science, Technology, Engineering, and Mathematics

UK – United Kingdom

UNCTAD – United Nations Conference on Trade and Development

UNDP – United Nations Development Programme

UNICEF – United Nations Children's Fund

US – United States

USA – United States of America

USSR – Union of Soviet Socialist Republics

UVCA – Ukrainian Venture Capital and Private Equity Association

VC – Venture Capital

WTO – World Trade Organisation

ACKNOWLEDGEMENTS

The IT Landscape: The Future of IT in Emerging Europe was prepared by the Emerging Europe Market Intelligence Team, led by Andrew Wrobel, head of editorial and research, and Oleksii Toporkov, research analyst, in close collaboration with the Editorial Team, led by Craig Turp-Balazs. It was designed by Karolina Antipenko.
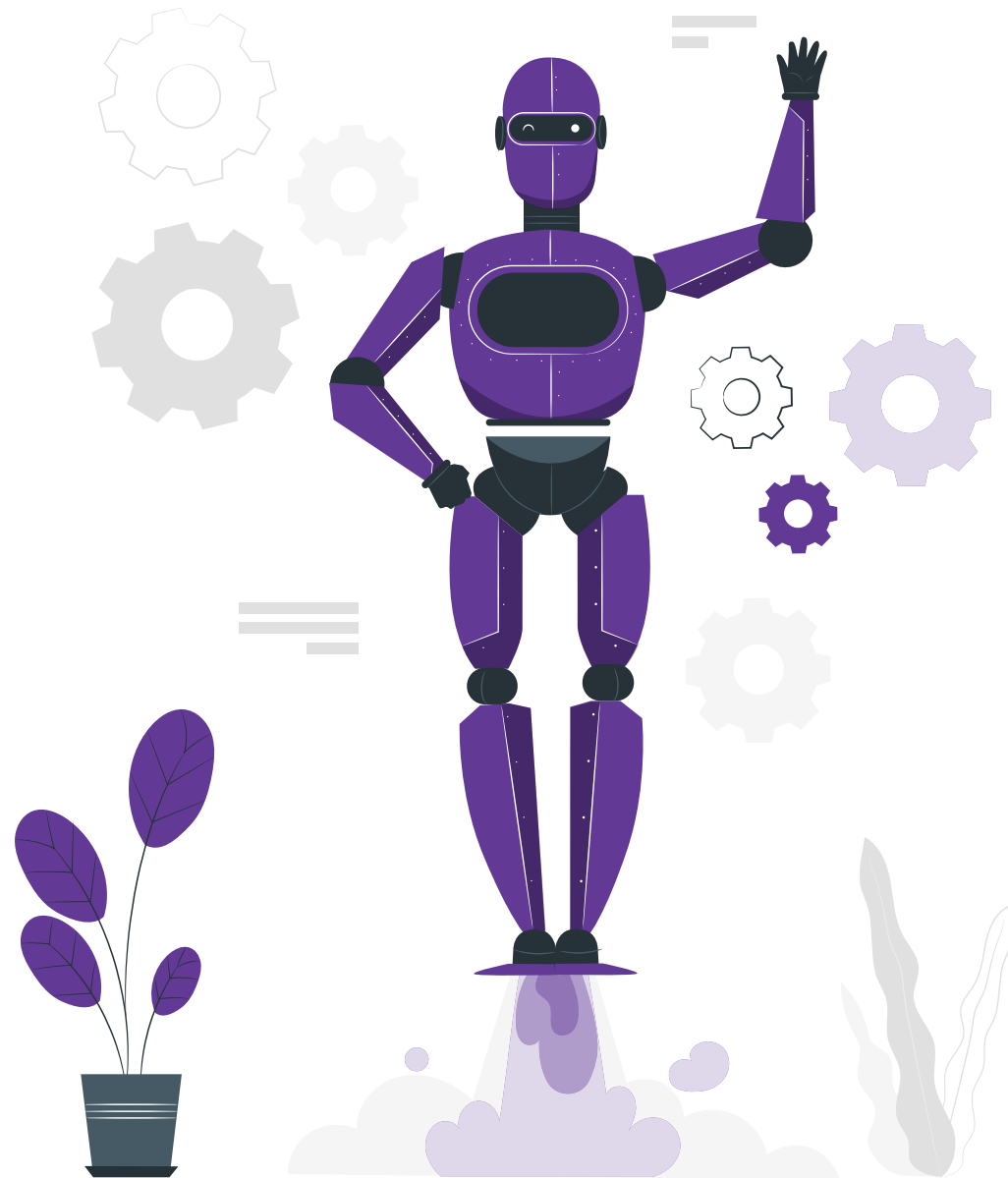
ACKNOWLEDGEMENTS

Emerging Europe would like to express appreciation to its partners:
• Global Tech Advocates and London Tech Advocates
• Clutch
• Global Sourcing Association, International Association of Outsourcing Professionals, German Outsourcing Association

We would like to extend our appreciation to our supporters, without which we would not have been able to complete the research:
• Arobs Transilvania
• Cluj IT Cluster
• EIT Health InnoStars
• Future Processing
• Information Technology Industry Development Agency (ITIDA) Egypt
• Markit
• Raiffeisen Bank Kosovo
• ScaleFocus
• Sciant
• Senla
• Sigma Software
• Unity Group
• Warsaw Stock Exchange
• Zesium

Finally, we would also like to extend our thanks to external and internal reviewers, as well as all the national and international organisations and governmental entities that helped us collect the statistics.