EMERGING EUROPE

INSIDE

IT Competitiveness Index Data-rich country profiles Insights from experts Key verticals and horizontals

FUTURE OF IT REPORT

The ultimate guide for IT buyers, investors and experts



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FUTURE OF IT REPORT

The ultimate guide for IT buyers, investors and experts

2022



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FUTURE OF IT REPORT

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FUTURE OF IT REPORT 2022





efore the Covid-19 pandemic, there was Dalready 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



ver the last three decades, the emerging Europe region has grown tremendously with a number of countries transitioning from poverty to wealth. However, according to the International Monetary Fund, there are just 39 (out of 195) economies globally that have been labelled 'advanced'. And since World War II fewer than 20 ioined this club of countries with a high level of per capita income, a varied export base, and a financial sector that's integrated into the global financial system. Among them, Greece and Portugal, followed by East Asian countries such as South Korea and Taiwan. The last decade has seen the group joined by small nations such as

A WORD FROM Chairman of the Tech Emerging Europe Advocates Advisory Board and former President of Bulgaria (2012-17)

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

A WORD FROM Emerging Europe's Founding Partner

Puerto Rico and San Marino and several from Central and Eastern Europe: Czechia, Slovakia, Lithuania, Latvia, Estonia, and Slovenia. All these economies share a per capita income above 17,000 US dollars and Hungary, Poland, and Romania are close to meeting that threshold. The secret to development is consistently strong growth. That growth is now being strengthened by digital transformation, entrepreneurship and innovation. This is no longer a region that robotically carries out repetitive processes at low cost. These processes are now being redesigned in the region. Large parts of the region can no longer be considered 'low cost' and the region's business partners both foreign investors and importers — understand that cost is no longer the primary motive behind their decision to expand or to, relocate in, or buy from the region. Access to a wealth of talent is now far more

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 Future of IT in Emerging Europe, co-branded by Tech Emerging Europe Advocates, which is part of the Global Tech Advocates network, is an important step towards doing just that.

important, as is the high quality of products and services. In this picture, the IT sector has a special place. The Future of IT is the second edition of Emerging Europe's deep

dive into the IT industry in the entire region using the same methodology to understand how each and every country contributes to the size of the regional market.

The IT Competitiveness Index, divided into four areas — talent, IT infrastructure, economic impact and business environment — shows areas where individual countries can become even more competitive. Finally, we have included four Central Asian countries — covered by Tech Emerging Europe Advocates, part of the Global Tech Advocates community of over 25,000 tech enthusiasts and professionals - 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**



he 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.



rowing 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.



alent, then talent, and again talent. Our countries are not making public the fact that there is so much talent in our countries. We are missing a trick. Investors only know about this wealth of talent from anecdotes, from companies which have already invested in the region. Central and Eastern Europe should stick together. We have something to offer on the global stage.

And not only that. According to Eurostat, eight out of 10 ICT specialists across the European Union are men. The proportion 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 identify all ways possible to boast about that internationally.









ovid 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 relatively similar competitive advantage.

he biggest strength of the Why is this important? Take the emerging Europe region, example of Serbia. The crisis only especially of the Balkans helped Serbia unlock its full potential. countries — lies in their geopolitical The foundation was set by the context. Historically, geopolitical dedicated leadership in the past few years, but in 2020, the most difficult turbulences turned people here into the best problem solvers, and vear for the world - the country managed to have the highest GDP the best innovators, as they live in constant "survival mode". Additionally, growth in Europe. Three reasons – by bridging east and west, countries agility and excellent problem-solving in the region need to maintain good skills, great relations with both east relations with both. Finally, this part and west, and finally, excellent tech of the world is famous for good math skills. I have the feeling that emerging Europe is not going to waste this and technical education, which produces solid engineering potential. crisis but position itself as the fresh frontrunner.

n 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

ast technological developments are making it very difficult for the existing formal educational system to address market needs in terms of talent. Countries and companies in the emerging Europe region are seeing this as a great opportunity to seize markets and grow companies, while nurturing local talent and providing amazing opportunities for their youth and their respective economies. Most, if not all, of the countries in the region



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, welleducated and thirsty population!

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-population!

have increased both public and private funding for training young people for the new world of work. Nevertheless, despite the increasing number of IT professionals in the region, more could be done in order to facilitate not just tech talent, but also nurture entrepreneurship and grow tech companies that in return would create more jobs and opportunities. Entrepreneurs and talent are the solution for the future.

Emerging Europe is a growth hub whose mission is to foster sustainable development in the emerging Europe region and contribute to its future.

With a focus on sustainability, technology and innovation and entrepreneurship we help organisations from or with a stake in the region thrive by leveraging our expertise, global exposure channels and network, as well as a strong local footprint.





INTELLIGENCE

communication decisions.

Solutions include site selection advisory, market expansion and research, FDI attraction and location branding.

EXPOSURE

emerging Europe region.

Solutions include editorial and multimedia content, reports, media tours and engagement, branding and events.

CONNECTION

Emerging Europe brings you closer to new partners, potential clients, multipliers, influencers and the wider Emerging Europe community, propelling your growth.

and business development.

MEET SOME **OF OUR CLIENTS**

Lithuania 🗞 stefanını SARIO

FIND OUT MORE

Access to industry and location-specific insight and our bespoke trainings and advisory will help you avoid pitfalls— and make better business and

Our ground-breaking content and game-changing programmes put your organisation in front of a global audience with an active stake in the

Solutions include business missions, events, communities, lead generation









BUILDING ON THE OPPORTUNITIES THAT COVID-19 HAS PRESENTED



wo vears into the Covid-19 pandemic we still see and experience the disruption it has caused and the impact is has made on the global economy and the outsourcing sector.

In Deloitte's 2021 Global Shared Services and Outsourcing Survey, organisations reported 'standarisation and process efficiency' as their most essential strategic objective, making 'reducing costs' second most important objective and 'driving business value' — third. Out of those who pointed to 'standardisation and process efficiency' as their goal, 78 per cent had already achieved it.

New workplace strategies have emerged as a key difference compared to the previous editions of the survey with three-quarters of all organisations planning to adopt a hybrid model and one in seven - mostly remote. Companies have also embraced a range of traditional and alternative models for retaining talent. 'Developing a strong culture' was implemented by 77 per cent of respondents, while 'emphasising well-being opportunities and

flexible work practices' by 62 per cent, and 'continuing improvement and innovation opportunities' for 62 per cent.

In the meantime, so much has changed in the labour market during the pandemic that it is nearly unrecognisable. The Great Resignation and the Great Enlightenment have led to millions exiting their jobs or expecting more attractive positions. As a result, companies are struggling to fill roles across almost every pay grade. The Conference Board says that labour shortages are the third largest challenge organisations face in 2022. McKinsey suggests that organisations are becoming increasingly creative in their human capital investment strategies.

The Randstad Sourceright's 2022 Talent Trends Report found a people-centric mindset amongst human capital executives. Now, 84 per cent of them says their businesses are more focused in the talent experience than in the past. Meanwhile, only 45 per cent claim that their talent acquisition strategy is more about value creation than

about achieving savings.

Companies intend to continue growing. According to the Talent Trends Report, more than half (53 per cent) of C-level executives plan to hire extensively over the next 12 months.

In the meantime, the UK's digital skills shortage has reached an alltime high. According to a recent DCMS report, the recruitment pool for cyber security professionals has a shortfall of 10,000 people a year. despite being the most sought-after tech skill in the country.

In 2021, the shortage of developers, which has been identified amongst the three jobs with the worst skills shortages in the UK behind HGV drivers and nurses, saw the biggest increase compared with previous years.

"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 workethic, 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," says 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 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 the 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 the 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 ecosystem, 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," the 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.



Common success Common challenges

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DERIVATIVES MARKET

COMMODITY MARKET

STRATEGIC INITIATIVES



STOCK MARKET

 GPW Growth Securities Lending System Trading Platform

DERIVATIVES MARKET

Derivatives Development



INFORMATION PRODUCTS

 GPW Data - GPW TCA TOOL



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COMMODITY MARKET

- Waste and Secondary Raw Materials Trading Platform
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- **GPW Private Market**
- GPW Tech
- GPW Ventures



IT COMPETITIVENESS INDEX

•he Future of IT gives a regional overview of the IT sector in the region, available talent, IT infrastructure, economic impact and current business environment as well as the room for potential growth. The IT Competitiveness Index outlined below evaluates the level of competitiveness of each individual country.

The Estonian IT sector was considered the most competitive in 2021, leading the region in 13 of 47 parameters (and in seven another parameters the country ranked in the top three), as well as winning one of four broad categories –

Business Environment. Favourable business conditions, broad implementation of online services and an abundance of talent as a percentage of total employment led to it taking the leading position this year.

Rank		Country		TOTAL		Talent		IT Infrastructure		Economic Impact	 E	Business Environment
1		Estonia		64.43		25.14		12.54		9.45		17.30
2		Poland	I	60.88		26.06		12.61		8.20		14.01
3		Czechia		59.25		23.67		9.63		9.22		16.73
4		Lithuania		57.75		21.02		13.29		7.69		15.76
5		Slovenia		57.32		22.59		9.92		8.15		16.65
6		Romania		57.10		23.06		12.51		9.65		11.88
7		Slovakia		55.85		23.60		9.67		7.99		14.59
8		Latvia		55.80		22.35		9.04		8.01		16.40
9		Hungary		55.21		22.73		11.75		7.90		12.83
10		Kosovo		54.96		27.60		10.28		9.69		7.40
11		Bulgaria		53.51		20.82		11.97		8.78		11.94
12		Serbia		52.50		22.95		9.40		8.79		11.37
13		Croatia		51.95		20.93		8.62		8.81		13.60
14		Ukraine		51.61	I	22.26		9.91	I	10.33		9.11
15		Belarus		51.28		23.26		10.20		9.57		8.25
16	1	North Macedonia	I	45.68		19.64	I	6.36		8.56		11.12
17		Moldova		44.78		15.63		11.27		8.04	1	9.84
18		Armenia		43.96	1	18.42		7.59		7.21		10.73
19		Georgia		42.74		12.16		6.19	1	10.03		14.37
20		Montenegro		38.91		12.60		5.57		9.18		11.57
21	1	Azerbaijan	1	38.73	1	11.32		7.15	1	11.53	1	8.74
22		Albania	Ι	38.22	Ι	12.89		6.57	1	9.35		9.40
23		Bosnia and Herzegovina		33.93		12.70		4.84	1	9.20		7.18

Kosovo is ranked 10th in the overall index, but it holds the leading position in the talent category – mainly due to the

significant improvement in education with a large number of new students entering universities in ICT field in 2020. Moreover,

			Talent	
Country	TOTAL FOR TALENT	Education	Labour force	Talent competitiveness
Kosovo	27.60	12.64	5.77	9.19
Poland	26.06	11.53	4.30	10.22
Estonia	25.14	9.92	4.46	10.75
Czechia	23.67	10.45	4.20	9.02
Slovakia	23.60	7.74	4.68	11.17
Belarus	23.26	9.53	4.44	9.29
Romania	23.06	10.23	3.14	9.69
Serbia	22.95	10.12	3.30	9.52
Hungary	22.73	10.12	4.06	8.55
Slovenia	22.59	7.05	4.4]	11.13
Latvia	22.35	8.64	4.48	9.24
Ukraine	22.26	12.09	2.56	7.60
Lithuania	21.02	7.21	4.30	9.50
Croatia	20.93	9.64	3.55	7.74
Bulgaria	20.82	9.68	3.16	7.98
North Macedonia	19.64	7.36	3.42	8.86
Armenia	18.42	8.50	4.05	5.87
Moldova	15.63	6.49	3.90	5.24
Albania	12.89	8.74	2.13	2.02
Bosnia and Herzegovina	12.70	5.06	1.74	5.90
Montenegro	12.60	6.42	3.04	3.13
Georgia	12.16	7.31	1.28	3.57
Azerbaijan	11.32	5.94	1.36	4.02

developers from Kosovo showed good results in the Google Code Jam competition this year.

The realisation of the Swedish 'lagom' principle can be seen in the Lithuanian position in the IT Infrastructure section. Although Lithuania leads the region only in one parameter within the section - international bandwidth per user – the right combination of fairly good results in other parameters allowed it to hold the first position.

		ITI	nfrastruct	ure
Country	TOTAL FOR IT INFRASTRUCTURE	Connectivity	Digital transformation	Non-personnel resources
Lithuania	_{13.29}	7.34	4.14	1.81
Poland	_{12.61}	5.94	5.57	1.10
Estonia	_{12.54}	2.97	6.57	3.00
Romania	12.51	8.00	3.53	0.98
Bulgaria	11.97	6.57	3.57	1.84
Hungary	11.75	6.96	3.45	1.35
Moldova	11.27	6.74	4.06	0.47
Kosovo	10.28	4.17	4.57	1.54
Belarus	10.20	6.04	3.62	0.53
Slovenia	9.92	3.06	4.99	1.87
Ukraine	9.91	6.22	3.11	0.58
Slovakia	9.67	4.75	3.80	1.12
Czechia	9.63	3.84	3.32	2.46
Serbia	9.40	4.88	3.93	0.59
Latvia	9.04	5.63	2.47	0.94
Croatia	8.62	3.53	4.08	1.01
Armenia	7.59	4.58	2.70	0.31
Azerbaijan	7.15	3.56	3.29	0.30
Albania	6.57	2.42	3.83	0.32
North Macedonia	6.36	2.10	3.95	0.32
Georgia	6.19	4.18	1.61	0.40
Montenegro	 5.57	3.71	1.54	0.32
Bosnia and Herzegovina	_{4.84}	3.23	1.22 	0.39

Azerbaijan is a great combination of cost competitiveness and realisation of expectations of the economic performance of the sector. Assessment of the economic performance showed that the country's IT sector was the most resistant to Covid vulnerabilities among all the countries of the region. Export, output and wages in the sector significantly outperformed linear expectations.

	1	Economic Impact					
Country	TOTAL FOR ECONOMIC IMPACT	Economic performance	Cost competitiveness	Covid Resistance			
Azerbaijan	11.53	2.43	5.10	4.00			
Ukraine	10.33	5.14	3.91	1.27			
Georgia	10.03	4.24	5.12	0.66			
Kosovo	9.69	1.97	6.80	0.91			
Romania	9.65	5.15	3.42	1.08			
Belarus	9.57	5.56	2.58	1.44			
Estonia	9.45	5.57	3.13	0.75			
Albania	9.35	3.59	5.35	0.40			
Czechia	9.22	4.48	3.97	0.77			
Bosnia and Herzegovina	9.20	2.87	5.16	1.18			
Montenegro	9.18	2.76	5.54	0.88			
Croatia	8.81	3.76	4.54	0.52			
Serbia	8.79	4.10	3.65	1.03			
Bulgaria	8.78	4.65	3.39	0.74			
North Macedonia	8.56	3.44	3.65	1.46			
Poland	8.20	3.36	4.01	0.83			
Slovenia	8.15	2.78	4.12	1.26			
Moldova	8.04	3.38	3.44	1.22			
Latvia	8.01	3.43	3.81	0.77			
Slovakia	7.99	2.48	4.51	1.00			
Hungary	7.90	2.83	4.41	0.66			
Lithuania	7.69	3.88	2.08	1.73			
Armenia	7.21	2.93	3.08	1.20			

The business environment in Estonia was unbeaten in 2020 – holding the first position in seven of 10 parameters represented in the section (with the highest results in the region for economic freedom, youth and social progress, property rights and cybersecurity). As a result, Estonia easily secured its first place.

				Business Environmer	nt
Country		TOTAL FOR BUSINESS ENVIRONMENT	Intellectual property and cyber security	Support for industry development	Economic competitiveness
Estonia		17.30	6.00	6.43	4.87
Czechia		16.73	4.79	7.36	4.58
Slovenia		16.65	4.37	7.85	4.43
Latvia		16.40	5.19	7.18	4.02
Lithuania		15.76	5.30	6.06	4.40
Slovakia		14.59	4.77	6.12	3.70
Georgia		14.37	3.54	7.56	3.27
Poland	1	14.01	4.20	5.79	4.02
Croatia		13.60	4.08	6.31	3.21
Hungary	1	12.83	4.69	_{5.00}	3.14
Bulgaria		11.94	3.29	5.79	2.86
Romania		11.88	4.07	4.92	2.89
Montenegro		11.57	2.45	6.69	2.42
Serbia		11.37	3.68	5.39	2.29
North Macedonia	1	11.12	3.29	6.06	1.76
Armenia	1	10.73	2.44	5.38	2.92
Moldova	1	9.84	2.78	5.71	1.35
Albania		9.40	2.21	5.41	1.78
Ukraine	1	9.11	2.01	5.75	1.36
Azerbaijan		8.74	4.03	3.62	1.10
Belarus		8.25	2.35	3.60	2.30
Kosovo		7.40	2.22	3.38	1.80
Bosnia and Herzegovina	1	7.18	0.74	4.97	1.47

CHAMPION CONNECT COOPERATE

Become part of a worldwide community of 25,000+ tech entrepreneurs, leaders, experts and investors — and have a role in making emerging Europe a global tech hub.





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emerging-europe.com/techadvocates

TECH EMERGING EUROPE ADVOCATES

REGIONAL OVERVIEW

region.

2021 saw steady growth across the board in the ICT sector of emerging Europe.

as much as the average gross salary in the region's economy (923 euros).

Across the 23 countries, the average gross salary in ICT was expected to grow to 1,818 euros, or nearly twice The number of people employed in ICT was well over 2 million, or 2.7 per cent of all people employed in the

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



ICT STUDENTS



ICT GRADUATES



ICT VALUE ADDED



For more detail, see how ICT salaries in the respective countries compared to the regional average in 2019: And here's how each country has fared with respect to their English proficiency, online services and economic freedom:

Country	Average salary in Average in ICT as in ICT of the (euros) regional ICT salary		Country	EF English Profi- ciency Index Rank 2021	Online Services Index Rank 2020	Economic Freedom Rank 2021
Estonia	1 2,574	153%	Albania	39	31	66
Lithuania	2,565	153%	Armenia	59	69	32
Slovenia	2,550	152%	Azerbaijan	86	65	38
Czechia	l 2,421	144%	Belarus	38	65	95
Slovakia	l 2,192	130%	Bosnia and Herzegovina	-	¹⁰⁴	82
Romania	2,035	121%	Bulgaria	23	47	35
Poland	2,032	121%	Croatia	10	52	79
Hungary	1,923	114%	Czechia	27	61	27
Latvia	1,866	111%	Estonia	22	2	8
Croatia	1,731	103%	Georgia	50	92	12
Bulgaria	1,665	99%	Hungary	17	55	55
Belarus	1,438	86%	Kosovo	-	-	58
Serbia	1,388	83%	Latvia	26	94	30
North Macedonia	1,222	73%	Lithuania	24	24	15
Bosnia and Herzegovina	1,105	66%	Moldova	36	52	85
Montenegro	1,047	62%	Montenegro	_	102	80
Armenia	942	56%	North Macedonia	-	58	46
Moldova	899	53%	Poland	16	22	41
Kosovo	697	41%	Romania	15	61	43
Albania	650	39%	Serbia	14	42	54
Ukraine	646	38%	Slovakia	20	63	61
Azerbaijan	558	33%	Slovenia	-	24	48
Georgia	531	32%	Ukraine	40	72	127
Emerging Europe	1,681	100%				



Romania nudged ahead of Czechia in terms of their output per 1 person employed in ICT. Kosovo was the runaway leader with 688 ICT students per 100,000 of population, while Ukraine and Albania both had the highest number of ICT graduates per 100,000 people.



Country		Output per 1 employed in ICT, euros	Country		Number of ICT students per 100,000 of population	Country		Number of ICT graduates per 100,000 of population
Romania		123,435	Kosovo	I	688	Ukraine		63
Czechia		123,000	Estonia	I	366	Albania		63
Estonia		109,421	North Macedonia		341	Estonia	I	58
Poland		93,889	Serbia		336	Belarus		57
Slovenia		91,159	Albania		295	Kosovo		51
Lithuania		87,148	Latvia		287	Serbia		46
Latvia		78,085	Ukraine		264	Czechia	I	43
Croatia		76,877	Czechia	I	261	Romania	I	43
Slovakia		76,800	Belarus		249	Croatia	I	42
Bulgaria		76,068	Hungary		243	Azerbaijan		40
Hungary		66,942	Georgia		226	Montenegro		39
Bosnia and Herzegovina	a	63,879	Slovenia		220	Armenia		38
Albania		60,030	Montenegro		217	Hungary		36
Serbia		57,455	Romania		206	Latvia		35
Montenegro		52,995	Armenia		182	Poland		32
Ukraine		49,259	Bulgaria		180	Moldova		32
North Macedonia		35,121	Croatia		180	Bulgaria		31
Belarus		32,869	Poland		175	North Macedonia		31
Georgia		29,531	Bosnia and Herzegovina	1	172	Slovenia		30
Moldova		23,675	Moldova		156	Slovakia		28
Armenia		21,072	Lithuania		146	Georgia	I	25
Azerbaijan		18,565	Slovakia		124	Lithuania		23
Kosovo		13,980	Azerbaijan		101	Bosnia and Herzegovina		21
Emerging Europe		76,707	Emerging Europe		222	Emerging Europe		43

Finally, let's also break it down into emerging Europe's 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.

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



ICT STUDENTS



ICT GRADUATES



Page 27





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 2016-22



ICT EMPLOYMENT IN 2016-22



ICT STUDENTS



ICT GRADUATES







ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22 ICT STUDENTS



Emerging Europe's subregion of North East Europe, often referred to as the Baltic States, consists of three countries that joined the European Union in 2004: Estonia, Latvia and Lithuania.

148,122

160,835

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22 ICT STUDENTS





ICT GRADUATES



ICT VALUE ADDED

3.73% 🥌

ICT GRADUATES

36,632

2020 38,487

4.35%

2016

4.86%

% of GDP

2016

2020

2020

2019

2018

ICT VALUE ADDED





SUPPORT DIGITAL UKRAINE

THE TECH ECOSYSTEM HAS TAKEN A HIT

The fear generated by the Russian invasion has put many service contracts and new deals on hold. This is putting the livelihoods of hundreds of thousands of people employed by Ukraine's tech community on the line.

HOW WE WILL HELP

Together with partners, we want to keep the achievements and potential of the Ukrainian tech ecosystem at the top of the minds of investors, buyers, opinion leaders and influencers.

We will show why Ukraine is a true digital nation and help its tech ecosystem restore trust and stay afloat.

WHY SUPPORT

The future of the Ukrainian tech ecosystem is vital for the country's future.

Tech businesses must stay afloat as the livelihoods of the 300,000 people depend on it.

FIND OUT HOW





With the support of





of Digital Transformation







GLOBAL ENTERPRISE BUYER PREFERENCES

utsourcing investment priorities, service criteria and offshore/nearshore buyer preferences for emerging Europe's digital and IT outsourcing services were all verified by 360 enterprise executives surveyed for the 2021 GBS World Competitiveness Index.

Emerging Europe is steadily becoming an epicentre of Global Business Services (GBS), particularly in digital and IT outsourcing (ITO) and customer experience lifecycle management. Increasingly, global buyers are looking to outsource more technology-enabled processes, digital channel services and data analytics functions to cut operating costs, improve

customer engagement and spread their geographic delivery risk across multiple sites and regions - including emerging and mature GBS markets in Emerging Europe.

Countries such as Bulgaria, Czechia, Hungary, Poland, Romania, Slovakia and Ukraine consistently feature as high performing digital and IT outsourcing locations. Others, such Belarus, Croatia, Estonia, Latvia, Lithuania, Serbia and Slovenia are ranked highly for their proficient and capable delivery centres and expertise.

GLOBAL GBS AND ITO TRENDS

The global GBS market is

currently valued at 232 billion US dollars and is dominated by the US which accounts for 25 per cent of the total market, according to Grand View Research. India is the largest offshore market for GBS and ITO service delivery along with China, Malaysia, the Philippines and Indonesia. Emerging (non-European) markets include Egypt, Colombia, Jamaica and South Africa.

IT outsourcing (ITO) is one of the largest sub-segments, valued at 66.5 billion US dollars in 2019. Other highly outsourced services include customer service/sales support, human resource management, finance and accounting and industry-specific services, represented in the chart below.

OUTSOURCING AND MANAGED SERVICES USAGE PLANS WORLDWIDE IN 2019, BY FUNCTION:



Source: 2019 Statista Research Department's Outsourcing and Managed Services Usage Plans Worldwide by Function Report

Over the last 18 months, the global economy has been thrown into a state of flux catalysed by the Covid-19 pandemic; however, unexpected and interesting trends have emerged in the sector. Rapid adoption of automation, digitalisation, cost mitigation, geographic decentralisation and new, multiple hybrid working models are the major shifts that have had - and will continue to have - a profound influence on global buying activities.

SPREADING DELIVERY **POINT RISK**

Progressively, global enterprise buvers are spreading their delivery sites across multiple regions as part of "de-risking" strategies to mitigate current and future disruptions caused by disasters, recessions and pandemics. This is diluting the concentration of GBS and ITO delivery from traditional markets such as India, the Philippines and Malaysia into emerging GBS and ITO delivery locations, including those in Emerging Europe. For instance in 2020, US-based GBS clients shifted over 24 per cent of their offshore projects and processes away from the Philippines due to business continuity and disaster recovery challenges they experienced during the pandemic, according to the Knowledge Executive Business Continuity Survey.

COST REDUCTION AND OUTPUT OUALITY A PRIORITY

To reduce costs, buyers are outsourcing more of their noncore business functions, but expect high-value service delivery and performance. Notably, the pandemic played a forceful hand in global buying shifts towards offshoring and nearshoring as a cost reduction and business continuity mechanism. As a result, global brands have realised lower labour and operational costs of between 40 per cent to 60 per cent or more through offshoring. They will continue on this path in an effort to meet shareholder expectations and boost profitability. Moreover, this trend is enabling them to focus on their core deliverables, improve time to market, deliver higherquality products/services and hit sales targets. However, standards in business and IT processing service delivery need to be upheld or even exceeded.

WFH AND REMOTE WORKING COMMONLY **ADOPTED**

Work-from-home (WFH) and remote working models have quickly been adopted by outsourcers and their clients during the pandemic. Enterprises noticed that their operations performed well, and in some cases, exceeded performance metrics during the WFH transition. Another compounding factor is that face-to-face processes have

WHERE IS YOUR ORGANISATION POSITIONED WITH REGARDS TO MULTIPLE HYBRID VIRTUAL AND PHYSICAL WORK MODELS?



Source: Knowledge Executive Global Vertical Industry Demand and Buyers Report, 2021

been virtualised, eradicating the need for physical office presence, according to the Deloitte Impact of COVID-19 on Shared Services and GBS. As such, many WFH working models have shown to be cost effective, saving 20 per cent to 30 per cent on operational costs. These models have also increased human capital flexibility, allowing firms to fill staff shortage gaps. mitigate time-crunch issues, focus on problem solving, and expand their regional and global talent pool by tapping into skilled workers anywhere in the world. However, to sustain high levels of productivity and corporate culture, many GBS and ITO operators are deploying a blended approach. These include hybrid working models where on-site and at-home ratios are being customised according to the requirements of the client.

NEW MULTIPLE HYBRID WORK MODELS

The transition to WFH/hybrid working models during the pandemic led to greater digitisation of operational processes and automation. In fact, in the years ahead, WFH/hybrid working models will be the new norm for both global enterprises and GBS/ ITO operators. Although most businesses have indicated that they will adopt some form of a hybrid working model, 32 per cent of global enterprises indicated that they still require their staff to work on-site full-time. Conversely, 44 per cent of enterprises will rotate their staff two to three days on-site and at home.

CONTINUED DEMAND FOR COMPLIANCE, SECURITY AND DATA PROTECTION

GBS service providers are constantly under pressure to meet evolving data privacy and security requirements due to the increased complexity and digitalisation of business ecosystems and the adoption of new working models. Combating cyber security threats and fulfilling stringent regulatory requirements are now key factors in winning business from clients. As a result, GBS and ITO service providers are being required to deliver complex as-a-service solutions and digitally-enabled services while reducing costs and increasing efficiencies for global clients. To ensure data security, increase operational agility and lower costs, cloud services are being rapidly adopted. Moreover, frontend automation and digitalised channels are streamlining low-value processes, allowing GBS and ITO workers to fulfil more complex, creative tasks.

NEARSHORING AND OFFSHORING

Emerging Europe's attractive GBS and IT-enabled services

PLANS TO DEPLOY, OVER THE NEXT 12 MONTHS?

Work-at-home agent (WAHA) deployment for frontline, voice contact center agents

Work-at-home (WAHA) deployment for back office processing workers

Deployed

Prioritizing essential customer demands/requirements

Conducting regular business impact analyses

Detailed plans with ranked recovery priorities

General remote/mobile workface deployment

Emergency response training for employees

Disaster recovery simulations

Crisis communication plans

Data center continuity plans

Secondary or back-up suppliers Outsourcing to third party operators

Altermative back-up/recovery sites

value proposition has caught the the broader global GBS market, attention of many nearshore and especially in areas such as evolving offshore enterprise outsourcing working models, outsourcing buyers and brands, drawing them next-gen digital business functions to the region. Other than its rich and the increased trend towards talent pool, Emerging Europe's business continuity offshoring. GBS value proposition is centred This has influenced the way in around cost, proximity, culture, and which buyers make decisions when its enabling environment, attracting considering what IT functions they buyers from all regions of the world. plan on outsourcing going forward The nearshore markets serviced include the following:

Belgium

- Denmark
- France

.

- Germanv
- Italy
- Netherlands .
- Norway
- Russia .
- Spain .
- Sweden
- Switzerland
- United Kingdom
- Canada

- ITO sector trends in emerging Europe closely reflect those of

WHAT BUSINESS CONTINUITY INITIATIVES HAS YOUR ORGANISATION DEPLOYED, OR

Plan to Deploy

while also mitigating disasters or service interruptions. **BUSINESS CONTINUITY** In fact, 67.65 per cent of global buyers interviewed for the 2021 Knowledge Executive Global Vertical Industry Demand and Buyers Report, indicated that they plan to outsource to third party operators as part of their business continuity strategies. These buyers have already deployed work-athome (WAH) frontline agents and back office processing workers as a key business continuity initiative. Addressing business disruptions in the form of compiling detailed

plans with ranked priorities. conducting disaster recovery simulations, and implementing more data centre continuity plans have been other core business

continuity initiatives they have

deployed.

Not Sure/NA

38 24%

32 35%

35 29%

26.47%

disaster preparation are among the top business continuity initiatives that buyers plan to deploy over the next 12 months. To insulate against future disruptions, buyers are planning to deploy more alternative back-up/recovery sites and contract secondary or back-up suppliers. Employee and organisation preparation initiatives include emergency response training and conducting regular business impact analyses. Already, 74 per cent of

REGIONAL ANALYSIS

Back-up plans and future

global GBS buyers have compiled a business continuity plan (BCP) in preparation of future crises. **IT OUTSOURCING**

12-MONTH INVESTMENT PLANS

Over 38 per cent of the 360 global enterprises surveyed are looking to outsource ethernet services and 35 per cent managed server hosting over the next 12

WHAT ITO FUNCTIONS ARE YOU PLANNING TO OUTSOURCE, RETAIN OR INVEST IN-**HOUSE OVER THE NEXT 12 MONTHS?**

Plan to outsource in next 12 months Already outsourced Invest or deploy in-house in next 12 months Already use in-house Do Not Utilise

Application Development 11,76% **Application Support & Management** Cyber Security Data Centre Functions Database Development & Management Data Processing & Storage Disaster Recovery Global Ethernet Services Hosted Contact Centre Solutions Hosted Telephony Hybird, Private and Public Cloud Services Managed Server Hosting Network Security Network Management Security Management-as-a-Service (SMaaS) Software Development Systems Development Technical Support Unified Communications User Experience (UX) Design/Management Virtual Private Networks Website Development

DIGITAL OUTSOURCING 12-MONTH INVESTMENT PLANS

Complex digital functions, including machine learning (38.24 per cent), blockchain and artificial intelligence (AI 26.47 per cent), will be among the most outsourced process automation (RPA 23.53 digital functions over the next per cent). Digital functions that 12 months, according to buyers have traditionally been managed surveyed. Other complex digital in-house are also scheduled functions that enterprises have for outsourcing include data indicated that will be outsourced analytics, e-commerce and include IoT technology/services mobile application development/ (29.41 per cent) and robotic management.

Source: Knowledge Executive Global Vertical Industry Demand and Buyers Report, 2021



China United Arab Emirates United States

months in an effort to reduce on-premise IT costs. Disaster recovery is another function that 29.4 per cent of enterprises plan to outsource to spread risk. From a business process management side, over 26 per cent of enterprises have indicated that they plan to outsource cyber security over the next 12 months. Moreover, 20 per cent plan to outsource software development while over 23 per cent plan to outsource technical support services.



Source: Knowledge Executive Global Vertical Industry Demand and Buyers Report, 2021

WHAT DIGITAL FUNCTIONS ARE YOU PLANNING TO OUTSOURCE, RETAIN OR INVEST **IN-HOUSE OVER THE NEXT 12 MONTHS?**

Plan to outsource in next 12 months Already outsourced Invest or deploy in-house in next 12 months Already use in-house Do Not Utilise



DATA ANALYTICS **OUTSOURCING 12-MONTH INVESTMENT PLANS**

of the main data analytics functions that over 35 per cent of enterprises will outsource over the next 12 months. Web/online analytics, speech and social media analytics

are other analytics functions enterprises plan to outsource, along with contact centre analytics (desktop and voice) and customer buying patterns.

Behavioural analytics is the one

WHAT DATA ANALYTICS ARE YOU PLANNING TO OUTSOURCE, RETAIN OR INVEST **IN-HOUSE OVER THE NEXT 12 MONTHS?**

Plan to outsource in next 12 months = Already outsourced = Invest or deploy in-house in next 12 months = Already use in-house = Do Not Utilise



Source: Knowledge Executive Global Vertical Industry Demand and Buyers Report, 2021

BUYER CRITERIA FOR ITO SERVICE PROVIDERS

When it comes to winning and retaining business, buyers have pointed to the provision of tailored commercial models aligned to service delivery as a major winning

factor. Being able to provide home-based or mobile worker capabilities is another criteria GBS and ITO service providers must have when pitching for, or retaining business, tying in with the global trend of WFH/hybrid working models and flexible human

WHAT ARE THE MAIN CRITERIA THAT YOUR IT OUTSOURCER MUST HAVE TO WIN AND RETAIN YOUR BUSINESS?

	Тор	1	Top 2
Vendor accredited and certified professionals	5,8	8%	
Vertical industry-specific expertise	2,94%		8,82%
Multi-shore delivery footprint		11,7	'6%
Multi-client location, multi-sourcing digital/IT services		8,82%	
Metrics for quality assurance/process improvement		11,7	' 6%
Cloud or web-based service architecture		8,82%	
Tailored commercial models aligned to service delivery			14,71%
Specialists home-based or mobile worker capabilities			14,71%
Evidence of success in previous digital/IT deployments	5,8	8%	
Automation and robotic process capabilities	2,94%		8,82%
Artificial intelligence (AI) expertise	5,88%		5,88%
Cost-performance benefits	2,94%	2,94%	
Digital/IT innovation and best practice	2,94%		2,94%
Leading edge security/data protecting capabilities	294,0		
Impact sourcing (recruiting disadvantaged youth)	8,82% <u></u>		

Source: Knowledge Executive Global Vertical Industry Demand and Buyers Report, 2021

GBS WORLD COMPETITIVENESS INDEX

EMERGING EUROPE DIGITAL AND ITO BUYER PREFERENCES

The type of IT functions that buyers plan to outsource also influences their decisions with regards to offshore and nearshore delivery locations. Notably, the 360 enterprise executives surveyed in Australia, Canada, Germany, France, the UK and the US that outsource

to nearshore and offshore regions ranked and rated each emerging European country in the GBS World Competitiveness Index. As a result, the top 10 countries were ranked in different digital and ITO subcategories according to their final scores and placed within three classifications: High Performer, Proficient and Capable.

capital requirements. Also linking to another prominent global trend, that of de-risking, GBS and ITO service providers must have a multi-shore delivery footprint to win business from buyers backed by metrics for quality assurance and process improvement.





GENERAL IT OUTSOURCING

Poland was ranked as a high performer country, followed by Romania and Czechia for general ITO services. Ukraine was noted as being a proficient emerging European country, with Belarus and Hungary following closely behind. Bulgaria leads the capable emerging European countries for general ITO services, followed by Slovakia, Estonia, and Serbia.

In the combined scores out of eight, buyers indicated that Hungary (5.24) is a top preferred

delivery location for digital outsourcing in the emerging Europe region, followed by Poland (4.76).

EMERGING EUROPE DIGITAL OUTSOURCING (SCORES OUT OF 8)



Source: GBS World Competitiveness Index, 2021

SOFTWARE DEVELOPMENT

When looking to outsource their software development requirements, global buyers noted

HIGHER PERFORMER

EE COUNTRIES

Ukraine

Poland

Romania

that Ukraine is a high performer country along with Poland and Romania. Amongst the proficient countries. Belarus received a high ranking, closely followed by Bulgaria

PROFICIENT EE COUNTRIES



Renowned for its software development talent, Ukraine (5.98) scored the highest for software development outsourcing amongst

buyers that outsource to emerging European countries, although followed closely in second place is Poland (5.39). Romania (4.89),

HIGHER PERFORMER EE COUNTRIES



Ukraine Belarus Hungary

PROFICIENT EE COUNTRIES



CAPABLE EE COUNTRIES

Source: GBS World Competitiveness Index, 2021

When rated out of a combined score of eight, Poland was ranked by global buyers as a top Emerging Europe destination for ITO, scoring

6.06. Romania (5.22) and Czechia (4.46) were scored in second and third places respectively. Ukraine (4.10) and Belarus (3.91) followed

close behind Czechia as prominent emerging Europe ITO destinations.

EMERGING EUROPE IT OUTSOURCING (SCORES OUT OF 8)



DIGITAL AND IT TALENT

For digital and IT talent and skills, Hungary was ranked as a leading

HIGHER PERFORMER EE COUNTRIES



destination in emerging Europe, with Poland and Bulgaria rated second and third respectively by global buyers surveyed for the Index. Serbia was selected among the

PROFICIENT EE COUNTRIES

CAPABLE EE COUNTRIES

Czechia, Romania and Kosovo.

Source: GBS World Competitiveness Index, 2021

markets noted as being proficient,

which included Croatia and Belarus.

Listed as capable countries, Ukraine

took the top position, followed by



Source: GBS World Competitiveness Index, 2021

Tying in third place is Bulgaria and Serbia, both scoring 4.06.

and Czechia. Hungary ranked in the top position for capable countries in the region, with Estonia, Serbia and Lithuania taking second, third, and fourth places respectively.

CAPABLE EE COUNTRIES

Source: GBS World Competitiveness Index, 2021

Belarus (4.08), and Bulgaria (3.90) were also amongst the top five countries for software development outsourcing.

Page 40

EMERGING SOFTWARE DEVELOPMENT OUTSOURCING (SCORES OUT OF 8)



TECHNICAL HELP DESK SUPPORT

Buyers have consistently pointed

HIGHER PERFORMER EE COUNTRIES



Poland (6.13) is ranked as a top

preferred Emerging European

country for technical and help

desk support outsourcing, due

Bulgaria

to Poland as a top high performer

location for technical and help desk

support in emerging Europe, along

with Hungary and Czechia. Bulgaria

PROFICIENT EE COUNTRIES

was the top-rated proficient country,



Source: GBS World Competitiveness Index, 2021

Source: GBS World Competitiveness Index, 2021

ranked alongside Romania and

countries in the region, Slovenia

CAPABLE EE COUNTRIES

Croatia. Amongst the capable

took the top spot, followed by

Belarus, Serbia and Ukraine.

Romania (3.81) were amongst the

EMERGING TECHNICAL HELP DESK SUPPORT (SCORES OUT OF 8)

Romania

Croatia



to its multilingual capabilities and rich IT talent. Hungary (5.19), Czechia (4.89), Bulgaria (4.02), and

top five emerging European delivery locations for technical and help desk support outsourcing.

DATA ANALYTICS AND DATA SCIENCE

In the data analytics and data science outsourcing category,

Poland was ranked as a high performer with Slovakia and Ukraine. Amongst the proficient countries, each rank was held by a one per cent margin, with Croatia,

HIGHER PERFORMER EE COUNTRIES



Overall, global buyers scored Poland as a leading location for data analytics and data science

outsourcing within the emerging European region, scoring 5.88. Slovakia (5.12), Ukraine (5.04), Croatia

EMERGING EUROPE DATA ANALYTICS AND DATA SCIENCE OUTSOURCING (SCORES OUT OF 8)



followed by Czechia and Belarus. Hungary was rated as a capable country along with Bulgaria, Slovenia and Romania.

PROFICIENT EE COUNTRIES CAPABLE EE COUNTRIES



Source: GBS World Competitiveness Index, 2021

(4.76), and Czechia (3.83) make up the remaining five high-scoring locations.

ROBOTICS AND AUTOMATION

Out of the high performer countries, Czechia was selected as

a top country for Robotic Process Automation (RPA) outsourcing, followed by Slovenia and Hungary. In this category, Poland was ranked as a proficient country, followed

PROFICIENT EE COUNTRIES

by Slovakia and Belarus. In the capable category, Romania took the top spot, with Estonia, Croatia, and Latvia taking second, third, and fourth places respectively.

CAPABLE EE COUNTRIES

HIGHER PERFORMER EE COUNTRIES







Source: GBS World Competitiveness Index, 2021

Well known for its robotics expertise and talent, Czechia was noted as a top overall delivery location for RPA outsourcing by buyers in the GBS World Competitiveness Index, scoring 5.88. Notably, Slovenia (5.45) and Hungary (5.18) were also ranked as preferred locations along with Poland (4.98) and Slovakia (4.11).

EMERGING ROBOTICS PROCESS AUTOMATION (RPA) OUTSOURCING (SCORES OUT OF 8)



Source: GBS World Competitiveness Index, 2021

EMERGING EUROPE'S GBS VALUE PROPOSITION

Several factors position emerging Europe as an excellent GBS and ITO hub of choice. The region's deep IT talent pool, particularly in software development, is filling the void of global IT professionals at an economical cost where quality is not compromised. Additionally, emerging Europe boasts vast multilingual capabilities, mostly in English, but also in a range of other European languages, attracting buyers from offshore English-speaking source markets and nearshore German, French, Italian and English source markets. Importantly, these capabilities contribute to the region being a popular base to service enterprise buyers from markets across Europe and as distant as Australia and North America. As such, the region is perfectly poised to gain a significant share of the global GBS market in the next three to five years. The Go-To Marketplace that Connects GBS Buyers and Providers Worldwide

GBS.

W²**RLD**

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GBS World **Register here without charge**: www.gbs.world

FROM HOBBY TO GLOBAL BUSINESS AND INVESTMENTS: The rise and rise of TECHIIA

Think globally from the very beginning. This is the foundation of TECHIIA, which was based in Ukraine but became global with more than 1,000 people on board.

ECHIIA today is a holding company that brings together a number of businesses across the world operating in IT products and infrastructure, software development and integration, UAV production and land surface data analysis, car-sharing service, merchandise manufacturing and distribution, and esports.

TECHIIA, as a legal entity, emerged in 2019, but its companies have been operating since 2012. When their number rose to ten, the founders realized that it was time to reorganise the management structure.

"By 2016 or so we already had companies in 15 countries, all in diverse places, and to be honest it had become a bit of a mess," savs TECHIIA's co-founder Yura Lazebnikov. "We dare to look beyond, but It became clear that if we wanted to grow the business it would need to be reorganized into the holding that would make everything scalable."

"We invest our own resources and we attract investments. The plan is to expand into new markets and new industries. TECHIIA meets compliance requirements in all sorts of places and jurisdictions," says Oleg Krot, another managing partner of TECHIIA.

Every year the holding grows into several new businesses - and the spheres of its interests become wider. With its diverse interests now under one umbrella, the pair say that they are ready to turn their multi-million US dollar company into a multi-billion US dollar one.



From hobby to global business

For the gregarious, globetrotting pair, gaming is where it all began. Krot and Lazebnikov have known each other for 20 years and met when they were both working on different IT projects but shared a passion for gaming: a love that neither appears to have lost.

They set up their first common enterprise, WePlay Esports, in 2012, to organise Dota and World of Tanks tournaments for gamers in Ukraine and CIS countries. At first, these were local competitions organised with their own enthusiasm. But once Krot and Lazebnikov were offered sponsorship by a wellknown European manufacturer of computer equipment, they realised that esports tournaments could be a whole lot more than a hobby.

And this was proved true, tapping into a new wave of esports popularity. Every year the industry was showing an increase of tens of per cent, the scope and fees of the tournaments growing.

But esports was only the beginning. As Lazebnikov explains, while WePlay Esports was the

first company under the TECHIIA umbrella to be founded, it has since been joined by several other enterprises that make use of the firm's tech expertise.

One of these is Enestech, a firm which develops software and hardware for the esports business. It has grown from a basic management tool used by a company-owned chain of gaming lounges to a full-blown, one-stop solution for thousands of businesses of all sizes across 65 countries.

There is also JMIND, an IT service company. And FS Holding with WP Merchandise, which produces, distributes and sells gaming, movie and comic book accessories, merchandise and equipment. Also, in-house venture studio VRTX Venture lab, which discovers and grows new businesses for TECHIIA, was created in the holding.

In 2021 several new businesses joined TECHIIA. One of these was Culver Aviation, which provides monitoring and analytics of the earth's surface based on data from self-manufactured drones. And then there is TECHIIA Motorsports, an American car-sharing business.

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Worldwide investments

TECHIIA has until now been built almost exclusively with Ukrainian talent, but that is changing fast. The holding's products and teams operate on all continents, except Antarctica.

"We do not see any borders or limits for our business." savs Lazebnikov. "Our ambitions are global."



Now TECHIIA is making partnerships worldwide in different business sectors - from IT engineering to merch production, from data analysis to unmanned aerial vehicles. The format is changing - the holding is becoming not just a business union, but an investment platform.

In 2022, the two business partners have set themselves the goal of doubling their assets and entering several new industries. Krot and Lazebnikov constantly invest in strong teams, making them part of TECHIIA. To systematise and speed up this process, the founders are planning to launch a new format venture fund soon. It will be focused

on revolutionary projects with a deep scientific component. "This is our response to the crisis in the venture capital market and the desire to breathe new life into it," says Krot. "We know what we are doing, we are building a solid infrastructure and are ready to grow even faster."

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FINTECH: A FAST GROWING AREA OF CEE'S TECHNOLOGY SECTOR



he term fintech relates to all products, companies and technologies that employ innovative, newly-developed technologies in banking and financial services. It has been one of the fastest growing areas of Eastern Europe's technology sector over the past decade, with two trends in particular spurring this growth: the proliferation of the internet, and the smartphone revolution.

Fintech has been spreading across emerging Europe more smoothly than in the case of the more developed West, where financial institutions and infrastructure have sometimes been slow to incorporate the rapidly progressing changes. After spending much of the twentieth century under communism, the CEE region was far less developed in terms of its banking and financial sectors, and was therefore more receptive to new trends.

Since economic liberalisation spread rapidly across the region in the 1990s, emerging European countries were unhindered by excessive institutionalisation and were able to embrace new technologies more freely. And yet, the penetration of digital payments is nowhere near the levels in Western Europe. While the EU average stands at 90 per cent of adults making use of these new

technologies, for non-EU countries this figure is at a mere 60 per cent. Fintech has plenty of economic

and social potential for the CEE region, and can contribute greatly to its development. For one, it can reduce the rural-urban economic divides which plague much of Eastern Europe by decreasing the necessity of physical bank locations. 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. In some of the countries we cover, 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 double digit percentages to the GDPs of seven countries in the region, 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 three Baltic states are among the world's most advanced and sophisticated fintech hubs. In 2020, an estimated average of 72 per cent of the population in the Baltics 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 Wise, which has greatly hastened and cheapened the process of international money transfers.

Lithuania has also taken strides towards becoming a major 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 startups is involved with fintech, with the market estimated to represent over





800 million euros.

The populations of the Visegard Four – Poland, Hungary, Czechia and Slovakia – have the highest proportions of users of online banking and money transaction services. Meanwhile, Bulgaria's capital city of 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.

With the success of companies such as Twisto and Microblink, Croatia has also landed on the global fintech map and set the stage for continued innovation in the field. Croatia's progress notwithstanding, the Balkans lag behind the rest of Europe in terms of the proportion of the 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.

Surprisingly enough, despite their late start in the ICT industry, Central Asian countries have also enjoyed considerable success in the field of fintech. Tajik programmers have revolutionised their banking

and e-commerce systems with their start-up Alif Sarmoya, the first of its kind in the region. Kazakhstan, meanwhile, has followed Lithuania's example to become one the few countries to run a specialised fintech regulatory sandbox. It is hard, and potentially



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misleading, to come up with sweeping generalisations for a region as broad and diversified as the one covered in this report. And yet, for many of the CEE countries the common denominator is that they are all hindered to some extent by a lack of financing paired with stringent financial and loaning regulations. Naturally, this makes the development of efficient fintech challenging.

Many of the nations also 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, due to geographical or economic constraints.

In spite of all these teething problems, the future looks promising for fintech in the region. Governments have been waking up to the positive applications of fintech and are beginning to create a more and more favourable environment for fintech to truly flourish across emerging European countries.



DIGITALISING OPERATIONS IN THE BANKING SECTOR

By Evlogi Georgiev



I hile 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 2022.

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 benefit and expand their customer 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. Fintech start-ups have

traditionally been a global disruptor, providing innovative, cuttingedge 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 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.

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 vields and loan demand. This focus on cost savings will drive a new wave of B2B innovations.

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 democratised. The extremely data intensive nature of the fintech industry will enable behavioural AI to grow to a whole new level.

INDUSTRIES

FINTECH & BANKING







¹¹They are industry experts that had a collaborative approach. Through-out our discussions, they shared their input and perspectives which we found invaluable. They were fantastic!"

Director of Business Development & Sales |



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RAPID EXPANSION OF E-COMMERCE IN THE CEE REGION

-commerce has clearly been taking the CEE market by storm in recent years. Understood as various business transactions conducted online, e-commerce most commonly relates to shopping online and in this particular department, there is still plenty of growth potential in the countries of emerging Europe. As a matter of fact, many of these countries are still in the process of digitising: as of 2020, as many as 21 per cent of households in Bulgaria did not have access to the internet, while for Romania this figure stood at 14 per cent. Naturally, this proportion is even higher in part of the Caucasus and Central Asia.

What this means is that there is more growth potential for e-commerce 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.

As the European Union continues expanding and taking in new members, allies and partner states across the emerging Europe region, countries start to benefit from access to consumers and supply chains from the more developed West. For instance, the e-commerce market in Romania went from a valuation of 1.1 billion euros in 2014 to 5.6 billion euros in 2020, and it represented the most important growth pillar of the Romanian retail sector. 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.

Disastrous on many levels, the Covid-19 pandemic did open a gigantic window of opportunity for e-commerce. Many people were suddenly driven to stay inside



for their own safety, especially in the case of populations that are particularly vulnerable to the disease. The lockdowns enforced by governments across the world saw the closure of all but essential stores, leading people to turn to online shopping instead. For many shops, the choice was really simple – either move to selling your goods online or go bankrupt.

The unprecedented situation also led to interesting innovations in the e-commerce sector. Ukrainian start-up Liki24, which delivers pharmaceutical goods to peoples' houses, saw its revenues increase exponentially during that time. Halfway through 2020, the company managed to raise 4.2 million euros in funding for its planned European expansion.

E-commerce has also been making strides in the more developed countries of the region, like the Visegrad Four. Czechia had one of the highest numbers of online stores per capita – around 43,000 as of 2019. The 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.

Over in Poland, the e-commerce sector is also booming. 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 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 Balkans, Croatia leads in terms of the proportion of e-commerce users, with over half of the population estimated to have made purchases online in 2020.

The sector remains somewhat underdeveloped in the Caucasus. As of 2021, more than 30 per cent of Armenians and Georgians didn't have internet access. Furthermore, the standards of goods delivery leave much to be desired in many parts of these countries, particularly rural areas. Meanwhile, according to

statista.com, Azerbaijan's fledgling e-commerce sector was projected to reach over two billion euros in 2022 and show an annual growth rate of 17 per cent in the coming years. In Kazakhstan, these figures stood at a projected market value of just under three billion euros in 2022 and a nearly 20 per cent growth rate going forward. All these figures are good news for the future of the e-commerce sectors in the region.

And yet, while e-commerce is growing rapidly in the CEE region, there are still some common limitations which mitigate growth. In many of the countries, 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 less than universal in much of Eastern Europe and the Caucasus.

Covid-19 and its aftermath 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.



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

By Tomasz Gutkowski

o 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 achieve 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, North America and the US, 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 – 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.

The wider your chain, the more likely you are to be based in shopping centres. Even when open, statistics show public hesitation led 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 warehousing and distribution – a trend seen in all countries.

As for online stores – which will still define a 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

\$ 40.80



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.



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CEE: A NEW STRONG PLAYER IN THE VIDEO GAMING INDUSTRY

lideo games have long been mainly associated with the United States. Japan and Western Europe, but the success of gaming developers from emerging Europe, Poland especially, has begun to change the stereotype in recent years. It is as good a sign as any that the CEE region is moving fast up the ICT value chain.

With developers and publishers in the region producing video games that have enjoyed both market and critical success. CEE has shifted from its perception as an outsource destination for Western gamedev companies to a powerhouse of creativity over the last two decades. In part this has been achieved by leveraging the know-how gained from outsourcing and the comprehensive STEM educations that many CEE countries offer.

Poland is the clear leader of the pack in emerging Europe in the gaming field, with a market worth 470 million euros and home to giants such as CD Projekt, PlayWay, 11 bit studios and Ten Square Games. CD Projekt, a large-scale dev and publisher behind the runaway success roleplaving game series The Witcher – which sold over 50 million units as of April 2021 – has become one of Poland's largest companies over the years, second only to the enerav concern PKN Orlen.

Rather than still emerging or maturing, the Polish video game industry is definitely a grown-up global player these days, a fact also evidenced by the differentiation within the industry itself. Just like in the West, Poland has large-scale producers who make big budget titles, a host of independent studios working on one game at a time, and a bourgeoning mobile game sector. Other countries in the region

have also enjoyed considerable success within the gaming industry. The Estonian game studio ZA / UM swept the awards circuit in 2019 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.

In Czechia, according to the statistics portal Statista, the gaming market revenue is projected to hit 166 million US dollars in 2022, and to grow to 208 million US dollars by 2026. Kingdom Come: Deliverance, a roleplaying game set in 15th century Bohemia, developed by the Czech gamedev Warhorse Studios, sold more than four million units as of November 2021. These are all very encouraging numbers for the





maturing Czech industry. Belarus has landed on the gaming map thanks to Wargaming and their online multiplayer hit World of Tanks which had more than 160 million active players worldwide as of December 2021. The game has also made its CEO Victor Kislyi a billionaire.

The rest of the CEE region has had some success in the gaming industry too, even if it is limited to only a few notable games coming from the country. While, for instance, Romania and Hungry are still mostly focused on outsourcing, notable games have come out of the two countries. Hungary's Zen Studio has seen international success with the Zen Pinball series and in Romania Angry Mob Games' Brawlout sold more than 50.000 copies within its first fortnight on Nintendo Switch. According to Statista, revenue in the game segment in Hungary is projected to reach 103 million US dollars in 2022. and to grow to 140 million US dollars by 2026.

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 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 Croatian video game market revenue is expected to reach 73 million US dollars in 2022, and to grow to 92 million US dollars by 2026.

Elsewhere in the Balkans. Serbia's Ebb Software has 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, while AI Interactive, a small twoperson studio from Bosnia and Herzegovina, has had their puzzle game The Enchanted World featured on the exclusive Apple Arcade mobile platform.

Beyond any doubt, emerging Europe countries have certainly got 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**

By Nikola Đorđević

oland 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."

So important is the gaming industry for Poland that in 2019 the Warsaw Stock Exchange (WSE), the largest in the region, 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 2019, 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 plaver 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.

Titles from Poland that have sold millions of copies around the world include CD Projekt's behemoth roleplaving 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."

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.

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.

HEALTHTECH: DATA-DRIVEN HEALTHCARE SOLUTIONS



ealthtech, also known as medtech, is the application of technology to health systems through devices, software, apps and procedures. While so far mostly limited to Western European countries like the UK, Switzerland and Germany, in recent years it has also been gaining ground in emerging European countries.

This expansion of healthtech can be attributed to several interconnected factors. Throughout Eastern Europe, demand for private healthcare has been fuelled by rising salaries and widespread budget cuts to previously robust public healthcare systems. This situation has led to long waiting lists, understaffed hospitals and poorer

quality service, and has pushed people to look for alternatives in the private sector.

Privatisation of healthcare has been spreading throughout the CEE region. Latvia, for example, spends under six per cent of its GDP on healthcare, compared to 11.2 per cent for France. The ageing populations are another factor driving the demand for healthtech in emerging European countries, as rising average ages naturally result in increased demand for health services. This is also 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.

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 with 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 healthtech industry received a strong boost with the arrival of the Covid-19 pandemic. A number of innovative companies were able to capitalise on the challenges raised by the crisis by offering efficient solutions. In Hungary, for instance, 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.

Another widespread consequence of the pandemic has been that fewer people take the risk of going to the doctor for trivial matters, especially 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.

The pandemic has also emphasized the need for datadriven healthcare. Data in particular can be vital in coming up with quick, innovative solutions to actively developing issues, like a quick-spreading virus. 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.

While the pandemic has led to the greatest amount of groundbreaking medical innovations in recent memory, noteworthy developments have also occurred in other medicine-related fields. 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. 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.

As is often the case with many other sectors of technology, numerous issues have a negative impact on the spread of healthtech in the CEE region. The health industry as a whole is often tightly regulated and dominated by the public sector, while corruption remains an ever-present spectre.

S·PRO Page 63

Taxes remain high in much of the region, with many countries of emerging Europe not offering any special tax regimes for tech companies and start-ups.

On top of these problems, more and more people are becoming worried that with the recent shift to data-driven public health responses. their sensitive data could fall into the wrong hands. In spite of all these problems, given the region's positive economic trajectory the demand for healthtech will only continue to grow in the coming years.





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THE FUTURE OF TECH in healthcare

The Covid-19 pandemic has accelerated several trends in healthcare: digitalisation, telemedicine, big data, AI. So what will the future of healthcare look like, and what will it mean for tech companies?

By Nikola Đorđević

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rom the very beginning of the Covid-19 pandemic, the need for technological solutions in a variety of fields became abundantly clear. Start-ups around the world stepped up, rapidly creating various contract tracing, telemedicine, and now Covid-19 status confirmation apps.

Software Professionals, or S-PRO, is a Ukrainian company that has been working in the healthtech industry for the past eight years. S-PRO is a boutique development company that works primarily in the fintech and healthcare spaces.

"We empower technology leaders to innovate with technologies and deliver products to the market faster," company CEO Igor Izraylevych tells Emerging Europe.

Some of firm's recent products include a blockchain app used for the confirmation of Covid-19 tests results, a solution produced for Hubspring that serves as a digital ecosystem for hospital staff, and an app that helps scientists collaborate with 3D visualisations of complex research results.

At the core of what S-PRO does is the meeting of healthcare and new technologies such as artificial intelligence, blockchain, data analysis and visualisation. With these technologies it's possible to innovate and make healthcare better.

"We used blockchain for storage



of patient Covid-19 results so people can use different types of tests and can share their results out of the blockchain within the mobile app. It provides transparency while providing better security for people," says Izraylevych, explaining the thinking behind basing the app on blockchain technology.

Indeed, data security is one of the main issues in healthtech in general. When any entity creates digital solutions for healthcare, it is often necessary for apps and platforms to work with sensitive data. Data about illnesses and medical status is considered especially sensitive and personal, and for good reason.

"Data security is one of the key challenges within the healthcare industry today. And companies have to pay a lot of attention as to how they maintain the data and securely store it," Izraylevych adds.

One possible way is HIPPA (Health Insurance Portability and Accountability Act, a US law on medical data privacy) certification.

"But engineers have to think for themselves how to use these standards in practice. For example, encoding the data in the right way and keeping the sensitive data stored correctly," he says.

So how will the future of healthcare look, despite the challenges?

"We live in a very interesting time where everything is changing," says Izraylevych.

This change is evident in the halthtech market. According to the consultancy McKinsey, the digital healthcare market will grow from 124 billion US dollars today to 427 billion US dollars in the next seven years.

"This is driven by venture-based companies who are coming to the market and providing new services for the niches where people need new and better services," Izraylevych tells Emerging Europe.

Last year also saw an increase in venture capital coming into the sector with total funding reaching 14.6 billion US dollars — twice as much as in 2019.



"The speed of our lives increased as did people's needs, as well as their requests for services. In terms of this trend, digitalisation comes into play and digitalisation in the health industry specifically," says Izraylevych.

A big role in the future of healthcare will be played by technology such as the blockchain, AI, and the Internet of Things (IOT).

"Using AI could decrease emergency room visits up to fifty per cent. And this could be achieved with control of general wellbeing and analysis of health data. Factors such as ecology, lifestyle, monitoring and detecting potentially dangerous diseases in the early stages," Izraylevych notes.

"This can be achieved generally with technologies such as end-toend analysis and this is something which is requested generally by business leaders in the healthcare sector."

As Izraylevych sees it, it's a win-win for both patients and hospitals.

"With this better quality of service, patients can pay the same amount of money and get better service. The hospitals themselves can optimise doctor hours and other expenditures such as rent and hospital utility costs."

As for S-PRO, Izraylevych says its next move is to grow its engineering team to 1,000 strong, and to enter the insurance market, where fintech and healthcare can come together.

"Technology has the power to combine different industries," he concludes.

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> Tim Overton CTO at Modo Energy

GOVTECH: NEW DYNAMIC BETWEEN THE GOVERNMENT AND THE PEOPLE

efined most simply as technology for public sector applications, govtech is any technology which makes government services more innovative and responsive. It is still in its early stages but breakthroughs in certain countries point to an exciting future where the interaction between the government and the public will be done online in an efficient manner.

While the region covered in this report has only really started on its govtech journey, some of the numbers are encouraging. According to the Covid-19 Digital Sentiment Insights survey by McKinsey & Company, 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.

As a matter of fact, there were almost 12 million new users of online services at the peak of the pandemic – more than the population 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 expected 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 had 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. 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.

These numbers are likely to go up even further thanks to govtech. Public administration processes used to be notoriously long and unclear in many countries of the region, but with the introduction of govtech these problems will hopefully soon become a thing of the past. Connecting the government to the public through the internet or cloud can restore a sense of trust from the public, improve transparency, accountability and good governance - all vital elements in the development of a stable civil society.

Another hope is that electronic voting will go a long way towards increasing voter participation and, in particular, towards galvanising 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.

A number of processes in Estonia have been greatly simplified, including voting, paying taxes and utilities, signing contracts, making bank transfers or applying for welfare. 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.



In the rest of the CEE region, however, 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.

There is a number of deep-seated factors which may limit the spread and growth of govtech, for the time being at least. Transparency and accountability may not be in the best interest for some powerful political factions in some of the countries in the region. Corrupt administrations have good reasons to fear any innovations which may lay bare their illegal activities.

A particularly pertinent issue for govtech companies to address is that some governments may express valid security concerns around govtech. 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.

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

REPORT

Redesigning public services and supporting digital transformation with automation

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E-MOBILITY ON THE RISE



-mobility refers to any technology which allows electrical propulsion of cars, buses, scooters and trains. With the spectre of a disastrous global warming looming on the horizon, the need for more environmentallyfriendly solutions has never been more pressing than it is today. Over the past decade, these mounting environmental problems have driven the growth of the e-mobility industry.

With the public growing more and more environmentallyconscious, governments have followed suit and started to recognise the implications of the alarming rate of climate change. The European Green Deal was unveiled in 2019 by the European Commission and consists of policy initiatives carrying the overall goal of making the entire European Union

climate-neutral by 2050. It also targets a 55 per cent reduction in greenhouse gases compared to the 1991 level.

This particular initiative as well as a string of similar ones from governments around the world 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.

There is a particularly vast space for growth for the e-mobility market in emerging European countries. Automobile ownership rates are lower in the region than in the rest of Europe, meaning there are fewer 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.

The widespread adoption of electric vehicles is more than welcome for the nations of emerging Europe as it will eventually result in lessened dependence on oil. Oil prices fluctuate wildly and the vast majority of the countries in the region do not have their own oil resources. This makes them dependent on outside providers. as well as these providers' whims. Electrifying a country's vehicles will take away this dependence on oil, thus freeing up the country to act more independently and become more self-sufficient as each of these countries produces its own electricity and has the capacity to produce more.

Poland, Czechia, Slovakia and Hungary – The Visegrád Four – have all made impressive progress in terms of e-mobility. In 2019, Czech car manufacturer Skoda 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. Europe's largest electric bus producer, Solaris, is based in Poland, and boasts a 25 per cent market share. Its vehicles are also exported to other countries, including to 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.

Meanwhile, French-owned Romanian car manufacturer Dacia has promised that 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. in 2020 Lithuania's Elinta

Motors unveiled an electric minibus to be used for public transportation. Estonia is home to Bolt – a company which started as an electronic scooter service in 2013 and currently operates in over 40 different countries.

Demand for electric cars has also been soaring in far 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 went up by 375 per cent.

The Balkans are still lagging behind most of Europe in electric vehicle ownership, with Croatia recording 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.

Throughout the region, e-mobility is now beginning to clear one of the greatest hurdles which hindered its progress until recently – namely, the cost. Electric cars remain 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, giving a big boost in competitiveness to the European electric car market and lessening the dependence on battery imports.

Given the limitations of oil - it's finite, detrimental to the



environment and subject to constant price fluctuations - it will likely continue to fade in the coming decades. The e-mobility sector, on the other hand, is one which is almost guaranteed to see continuous growth in the coming vears.

As the electric car industry is still not fully mature, this presents an exciting opportunity for investors. and emerging Europe figures to be an attractive nearshoring destination for production of vehicles and vehicle components.


USING ONLINE B2B MARKETPLACES TO BUY IT HARDWARE AND ACCESSORIES

By Andres Agasild

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. Solving the dilemma of having more IT suppliers to minimise supply risk v reducing the number of suppliers to save time and money on supplier management and contractual/compliance obligations.





n 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.

1. Technology touches even more aspects of business, leading to IT demand increases.

2. Continued economic uncertainty raises the focus on business agility, contingency planning and risk mitigation.

3. Trusted IT supplier relationships will become even more important.

4. Acceleration of IT procurement automation will lead to increased transparency and spend visibility.

5. Sustainable IT procurement initiatives increase to meet consumer and compliance demands.

6. HR departments will optimise more talent for adaptation, transformation and agility.

7. CFOs continue to minimise fixed costs and non-essential spend. 8. B2B marketplace usage

continues to grow.

9. Shortening IT supply chains whilst solving the global v local consolidation dilemma persists.

The 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.

58.8 per cent of B2B buyers now conduct at least 25 per cent of their business purchasing on a marketplace, according to Digital Commerce 360 B2B (2020)

According to Gartner, at least 70 per cent of enterprise marketplaces will serve B2B transactions by 2023.

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

The sweet spot for an IT device marketplace is where the products that are being bought:

1. Are available in a wide variety of options

2. Have a relatively low unit cost. 3. Have a high annual order count.

4. 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 e.g., 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 e.g., 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.

The pandemic has highlighted the issues and unpredictability of IT supply chains that stretch thousands of kilometers and the risk of supplier consolidation when a critical supplier was adversely affected. But even before Covid-19 the local v global dilemma existed. The challenge is how to shorten supply chains, buy more locally and at the same consolidate IT hardware

"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

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 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! Sounds impossible but it is not - we addressed the dilemma in a report written for Procurement Leaders: The Indirect



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IT Procurement Dilemma – Solved. In it we showed how the singlevendor model for B2B marketplaces can give buyers the best of both worlds. We call it the Marketplaceas-a-Supplier solution (MaaS).

In 2022 more IT buying decision makers will seek a marketplaceas-a-supplier that can offer singlevendor, 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.



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TAKE THE CHASING OUT OF IT PURCHASING

CYBERSECURITY IN EMERGING EUROPE

ybersecurity is a growing concern for companies and individuals around the world. As the world becomes increasingly digitised, both the public and private sectors are exposed to various forms of online threats. Companies risk losing huge amounts of money, people can have personal information stolen and governmental institutions can be compromised by ill-intentioned actors. The growing number of well-trained ICT specialists around the world is something of a doubleedged sword as the knowledge and skills of such specialists can also be used for illegal purposes.

In the CEE region, the threat is more true than ever. The expansion of corporate activity and the proliferation of personal computer ownership over the past few decades have opened the door for cybercrime in different shapes and forms. To make the matters worse. cyberattacks are becoming more and more sophisticated, owing partly to the development of the ICT industries. According to some estimates, cyberattacks are the third biggest organised criminal industry in the world today.

In 2019, 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. The following year, the website of North Macedonia's state election commission was targeted on the day of polling during national elections. More than just a threat to the profits of businesses, such disturbing attacks constitute legitimate geopolitical or even military threats to the security of countries.

With the recent move towards e-governance in countries like Estonia, this is particularly concerning as what should be a positive step forward for the country could instead expose



the country to harm. The same is true for individuals. who. with their online presence growing, are becoming increasingly susceptible to cyberattacks and could have their personal data, private information as well as money taken from them. Sadly, in some parts of emerging Europe individuals are also vulnerable to cyberattacks or excessive monitoring by their own governments or other vested powers.

The Covid-19 pandemic has resulted in an unexpected spike in cyberattacks, due mostly to the fact that a great number of businesses and services were pushed online as in-person service suddenly became impossible. With governments around the world resorting to datadriven solutions to public health issues, unprecedented amount of personal data is stored online.

To tackle the challenges posed by the increasing amounts of cybercrime, governments are coming up with ways to bolster cybersecurity. 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, Azerbaijan, Armenia and Georgia, making them particularly vulnerable to cyberattacks.

In 2020, Romania's capital of Bucharest was selected to host the European Cybersecurity Competence Centre, a research centre for encryption and network security, beating other European cities like Brussels, Vilnius and Luxembourg. Romania has long been known as a European cybersecurity hub and the birthplace of Bitdefender, one of the world's largest anti-malware companies. Bitdefender has worked with the likes of Europol, Interpol and the FBI, and as of 2018 it recorded over 500 million users around the world.

Meanwhile in the Balkans, Kosovo established a national cybersecurity strategy in 2020. Serbia followed suit the same year, indicating that governments are starting to take the issue more seriously. The three Baltic states have also made some progress in terms of cybersecurity. In 2020. Estonian start-up RangeForce raised 16 million dollars in funding for its cybersecurity training programme while Lithuania ranked 6th in the Global Cybersecurity Index. with the Lithuanian government also running a National Cybersecurity Centre.

And yet, CEE countries still have a long way to go towards improving their cybersecurity. As per the Cybersecurity in CEE Report



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of 2018, as many as 65 per cent of companies in Central and Eastern Europe don't have a cybersecurity strategy. Meanwhile, companies in the surveyed regions lost an average of 1,100 euros a month to cyberattacks. As follows from the major cybersecurity attacks on North Macedonia. Bulgaria and Georgia in recent years, cyberattacks seem to be getting the better of whatever defences they come across, in many instances simply because companies or state institutions treat the threat too lightly. There's no way around it cybercrime has become a serious problem and it's time governments, businesses as well as individuals took it as such.

AI: A NEW FRONTIER IN COMPUTING



nderstood as the ability of a digital machine to simulate the intelligence of people and perform tasks normally associated with living beings. Artificial Intelligence (AI) is widely seen as the future of computing and as an important sector of the global economy in the foreseeable future and beyond.

Emerging Europe's Al potential is clearly unlimited, with Poland, Estonia, Belarus and Ukraine already having established themselves as regional AI powerhouses. Over the past decades, most of the countries in the region have put a lot of emphasis on maths and sciences as part of their curricula, laying a solid foundation of human capital necessary for the development of Al. Adding to this foundation are

the fast and cheap internet in much of the region and ever-increasing internet penetration rates.

Al can improve a virtually limitless array of activities performed with the use of technology, for instance in sectors as vast as education, law enforcement, healthcare or economic planning. Al can streamline all kinds of business processes, something it has already been doing for years in emerging Europe's prolific gaming industry. It can also be used in a number of ways by the army, with national militaries in the region among the biggest researchers on the topic. On an even broader scale, AI can contribute to solving worldwide problems such as climate change, food shortages or declining demographics.

Despite their relative economic underdevelopment, Ukraine and Belarus have been making remarkable progress in terms of Al development, a fact perhaps best evidenced by the presence of some of the greatest tech giants in these two markets. Ukrainian Al was first put on the map in 2015 when, in a deal worth a reported 150 million US dollars, popular social media app Snapchat bought Ukrainian company Looksery for its 'lenses' feature. Shortly after this and in a similar move, Facebook bought Belarusian startup Msqrd, a company offering a similar technology to Looksery. A few months later, Google bought yet another Belarussian Al startup, AlMatter to assist with its image processing.

AllRight, a Ukrainian producer of an English-learning app, raised 4.2 million euros for international expansion in 2020. The success of this Al-driven start-up serves as a good example of how AI can be used to improve the quality of learning.

Estonia, Latvia and Lithuania are verv much up-to-date with AI trends. with all 3 Baltic states possessing sophisticated e-governance capabilities. They are also part of the Declaration of Collaboration on AI in the Nordic-Baltic Region, a multilateral initiative for AI development. Fyma. Estonian start-up which uses AI to turn CCTV cameras into motion analytics sensors, raised 1.4 million euros in funding in 2020.

In 2018. Lithuanian Railwavs started integrating its technologies and assets into a unified AI-powered system. Meanwhile in Central Europe, TAIA, a Slovenian translation software raised 1.4 million euros in venture capital funding.

Aiming to set its data economy in motion, Hungary established the National Data Asset Agency (NAVÜ) as part of its AI strategy. Rather than just store data, the system manages the strategic data asset, encourages the use of secondary data and ensures that public and private records enter the economic bloodstream as assets of pecuniary value. The National AI Lab facilitates applied research ensuring that research projects are aligned with market demand, while the AI Innovation Centre helps SMEs adopt AI tech in largest possible numbers.

As per the country's 2019 Action Plan, Serbia considered the use of Al in its justice system, with the plan assuming that AI would be used for 'predictive justice'. This mirrors to some extent the plans of the Armenian Ministry of Justice which has also discussed using AI in Armenia's judiciary system to reduce the work of court staff. As a matter of fact, the Armenian government has identified Artificial Intelligence as a sector with vast potential and tagged its development as one of the country's priorities. Elsewhere in Asia, Kazakhstan has started combining big data and AI to improve its healthcare system, with AI assisting diagnostics and treatment of various conditions.

Beyond the general European Union Al Alliance, most of the countries covered in this report

have either already implemented or started to create elements of Al strategies. The exceptions to this rule are Albania, Armenia, Azerbaijan. Belarus. Bosnia and Herzegovina, Georgia, Kosovo, Moldova, Montenegro and North Macedonia. The governments of these countries will soon need to form their own plans in order to avoid being left behind.

Al 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. In order to ensure a smooth



development of the AI sector, national governments will need to create a clear legal, regulatory and ethical framework for companies to develop the technology in - something that many of the countries in the region have yet to do. There are certainly many ethical pitfalls to be mindful of, such as 'predictive justice' possibly being used to exacerbate class inequality or validate racial or ethnic profiling. Developing the AI sector in a way that would be beneficial for society is one of the greatest challenges going forward.



THE INTERNET OF **THINGS: DEVICES** COMMUNICATING WITH EACH OTHER

'he Internet of Things (IoT) refers to computing devices that are connected to the internet, can gather data and 'communicate' with other devices. IoT comes with a great number of applications ranging from small devices like smartphones, smart TVs, smart watches, earphones and 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, and it is yet another exciting, new frontier in technology.

The economic growth in emerging European countries has led to a significant spike in demand for consumer items. Internet access has also been constantly increasing throughout the region, particularly in the past decade as infrastructure improves and Internet becomes cheaper and faster. This constantly creates more and more consumers for IoT devices.

CEE countries spent 9.7 billion US dollars on Internet of Things devices in 2017. 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 in the near future as the world begins to transition to post-

On top of being a growing market for IoT devices, emerging European countries can also become producers of such devices. Many western producers already 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.

Some countries have gone beyond treating IoT in terms of consumer goods only, putting forth ambitious plans to create interconnected smart cities using this technology. According to these plans, IoT would be used to create an interconnected grid of various facilities and bits of infrastructure of the city, such as electricity, traffic

lights and central heating systems. One can think of many potential applications of such systems in the countries of emerging Europe. Obsolete infrastructure in many cities of the region often leads to periods of no heating or hot water, a dangerous and potentially fatal occurrence in the winter. Being able to make these systems selfsustaining 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.

As is the case with many other technologies in this report, the movement for smart cities has picked up the most momentum in the Baltic states, and in particular in Estonia. In 2018, the country's capital city of Tallinn declared an intention to become a smart city with 86 e-government services as of that year. Not to be outdone, Latvia's





capital of Riga announced a similar initiative that same year.

And yet, most emerging Europe countries still have a long way to go before they can take full advantage of the wonders of the IoT technology. In several countries in the region, for instance in Georgia, Ukraine or Bosnia and Herzegovina, a quarter of the population or more still lacks access to the Internet. which greatly hampers 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.

Nevertheless, demand for IoT consumer goods is clearly on the rise, despite the recent Covid-driven setback. As the nations of emerging Europe continue developing their ICT capabilities, the wide-ranging benefits of IoT could be seen sooner than expected.



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BLOCKCHAIN: MORE THAN JUST CRYPTOCURRENCY

lockchain has a range of applications which have the potential to revolutionise entire industries. It has gathered plenty of momentum in recent years but remains a relatively new technology. It functions as a decentralised ledger of transactions which is duplicated and sent to all computers and devices on the network, a feature which renders Blockchain virtually impossible to be altered. With the history of any digital asset available for all to see, Blockchain provides its users with unprecedented levels transparency and accountability.

Blockchain is most commonly associated with cryptocurrency, especially Bitcoin, and it can have a range of benefits for emerging Europe countries. 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, and it ranked 4th in the world the following year, trailing only the developing economies of Vietnam, India and Pakistan. Interestingly, in 2021 there were no European countries in the global top 20 other than Ukraine and Russia.

There are several reasons why emerging Europe is generally receptive to cryptocurrencies. Much of the region had severely underdeveloped banking infrastructure after the collapse of communism in the 1980s and 1990s, which forced people to look for alternatives. A relatively low sense of trust in traditional banks was subsequently fuelled by the economic crises in the 1990s. 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. The four nations of Russia, Ukraine, Belarus and Moldova accounted for 12 per cent of cryptocurrency transactions worldwide in 2020, granting a



solid foundation for blockchain technology to grow in emerging European countries.

Servicing this demand for cryptocurrency trading are a number of recently-founded start-up blockchain companies. Slovakian start-up altFINS raised one million euros in seed funding in 2020, for its app which allows people to aggregate data relating to the cryptocurrency market. In 2021, 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 begun 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.

Blockchain technology, however, is much more than just cryptocurrency. For instance, it can be used for electronic contracts, a service which has been growing rapidly in recent years. This is especially important in countries like the Baltic states, where many e-government services provided are registered using blockchain technology. Given its nature as a public ledger that anyone can access. blockchain is also unrivalled in terms of building trust and transparency.

The Georgian government has started using blockchain technology for the country's national public registry, with land claims stored digitally and able to be independently verified. This innovative use of blockchain technology is of particular use for countries in emerging Europe, where laws are often 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.



Recognizing the benefits of blockchain technology, in 2019 Slovenia became the world's second country after China to establish national blockchain testing infrastructure, known as SI-Chain.

The private sector can also use blockchain technology in a variety of ways. The blockchain ledger allows businesses to demonstrate proof of their reliability and trustworthiness as items can now be tracked from their point of origin onwards, which makes counterfeiting much harder than it used to be. Ukrainian start-up UATAG combats counterfeiting in a particularly innovative and inexpensive way by using a photo of a piece of shattered glass to tag elements in the blockchain.

There are many start-ups and companies in the emerging Europe region which service this demand. Poland's 10Clouds and Bulgaria's Limechain have partnerships with prominent international companies in developing software using blockchain technology. Serbia has also been developing a strong

blockchain sector, which was given a boost in 2020 when the government proposed a Law on Digital Assets. Serbia also ranked 5th worldwide in the sheer number of blockchain developers in 2020 and that same year a Serbian blockchain company MobileGo reached a valuation of 56 million dollars.

Countries around the world have been slow to pass policies or initiatives related to blockchain technology, with Slovenia and China as the only countries in the world with specific national blockchain testing sandboxes. And while blockchain technology does have a dark side - with cryptocurrencies used for trading illegal items like drugs, weapons or forged documents – recent trends such as the European Union's call to create a unified regulatory regime for blockchain technology indicate that we are already moving in the right direction.

CLOUD COMPUTING: POWERING CEE'S DIGITAL TRANSFORMATION

Ioud computing is a method of delivering computing resources such as data centres, server space or software through the internet, or the 'cloud'. As the world is becoming more and more digitised, the demand for cloud computing has been rising exponentially. The increase in data use has made it increasingly expensive for businesses to maintain all their vital files. data and systems on in-house servers, which in turn has opened the door for companies specialising in cloud computing to do this background work on behalf of their client companies.

Countries throughout emerging Europe have benefited from cloud computing through outsourcing, with many international companies from all around the world contracting companies from the CEE region to do their cloud computing.

There are various ways in which companies can profit from cloud computing, but the most important of them is probably cost saving. Companies no longer need to maintain their own systems - instead of having to maintain their own systems, a cost which increases with the size of the operation, businesses can contract others to do this for them at a flat rate. The same applies to saving resources on cybersecurity as cloud computing companies are also responsible for maintaining adequate security around their software.

An added benefit is that cloud computing offers greater protection against potentially catastrophic losses of vital data. Cloud computing also allows companies to access software on demand, instead of having to stockpile software which they may or may not end up using.

As countries move towards e-governance and integrated smart cities, cloud computing is ready to help there too. In recent years, there has been a surge in demand for storage space for all



the data such wide-ranging projects lives. require, especially in some of the smaller countries of emerging Europe. Software cloud services (SaaS) dominated Eastern Europe's cloud computing sector in 2018, taking up 62 per cent of the market.

When the world was grappling with the initial stages of the Covid-19 pandemic, companies all over the world were driven into the virtual realm as countries instituted full lockdowns. Predictably, this also drove the demand for cloud services, with business processes suddenly coordinated entirely online. Being cut off from physical workspaces required companies to come up with replacement storage spaces, something that could only be done cost-effectively through cloud computing. And as a postpandemic reality begins ever so slowly to emerge, it is clear that the crisis has only increased the presence of online technology in our technology.

In emerging Europe, Poland is one of the leaders in cloud computing. In 2018, a 'National Cloud' was established in Poland through a joint initiative by the country's PKO Bank and the Polish Development Fund. This made it significantly cheaper for Polish enterprises to subscribe to, and went a long way towards supporting and bolstering the digitisation of the Polish society.

In 2019, Google signed a strategic agreement with Poland's National Cloud and received access to Poland's cloud services. 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

Cloud computing technology is also making strides in other parts of the CEE region. Much like Poland's National Cloud, there is a government-run cloud service in Azerbaijan, known as AzCloud. Similar systems also operate in the three Baltic states as well as in Kazakhstan, where cloud computing can be of particular help given the country's vast geography and distances between cities and remote villages, the hope being that cloud services can facilitate some of the government's functions and communications.

Elsewhere in emerging Europe, a Romanian cloud computing company Star Storage has made

waves around the world and struck up a 10-year working relationship with Japanese electronics conglomerate Hitachi. All these successes

notwithstanding, much of emerging Europe has been relatively slow to take advantage of the benefits of cloud computing, in spite of the great opportunity for digitisation that presented itself in the form of the otherwise devastating pandemic. In Serbia, for example, half of surveyed companies reported not using advanced cloud computing, compared to just 18 per cent of worldwide ICT companies. Hopefully, governments in the CEE region will gradually wake up to



the potential of cloud computing and will produce more initiatives like the National Cloud project in Poland in order to speed up regional digitisation efforts.

LIMITLESS APPLICATIONS **OF VR AND AR**

/irtual and augmented realities, or simply VR and AR, have been the hottest sector within the ICT sphere in recent years. With a limitless number of potential applications from entertainment in the form of immersive video games to helping surgeons and engineers access information faster and in more convenient ways – it's not hard to see why this should be the case. Many countries in the CEE

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 can be found in most emerging Europe countries.

The stakes are certainly high, with the VR and AR market expected to reach a value of nearly 60 billion euros by 2024 as per the statistics portal Statista. 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 startups from around the world.

One of the emerging key players in the region is an Estonian start-up called Wolfprint 3D. a company working on making avatars for use in virtual spaces more realistic. The company is able to create these avatars from a single selfie image, and its clients include Tencent. Huawei, HTC, Vodafone, and



Wargaming. Estonia is also home to the R&D centre of Criffin, a Londonbased company developing VR for industrial and military applications.

Given Poland's strong video game industry, it is not surprising that many gamedevs are also exploring the VR/AR space. In particular, the country excels in the number of software developers for the VR platforms, with a search on Clutch. io revealing more than 50 active companies around the country.

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.

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

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.

Another edtech 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.

It may still be early days for VR and AR in the CEE region, but there is certainly appetite for more success among local companies. 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.

One of the better examples in terms of promoting virtual and augmented reality comes from Estonia. The Estonian government has spent around one million



euros to create a VR-based showroom of the country's digital accomplishments. It includes a 360-degree video virtual sit-down with the country's president Kersti Kaljulaid.

The region's innovative startups are already making extended reality products that are attracting international attention, from video games to the aerospace industry. It is clear that the potential for the VR/ AR market in emerging Europe is ample.

FUTURE OF IT REPORT 2022 | **EEMERGING EUROPE**

5G: THE LATEST GLOBAL WIRELESS STANDARD

G is the 5th generation mobile network. the newest technology standard of broadband mobile networks following in the footsteps of 1G, 2G, 3G, and 4G networks. It features highest-ever multi-Gbps data speeds, increased availability and network capacity along with ultra-low latency. The applications of 5G are largely unlimited and with the meteoric rise of Internet of Things (IoT) products and Al-capable devices, 5G allows us to connect virtually everyone and everything.

Ever since South Korea became the first country to adopt it fully in April 2019, 5G has been spreading across the global market with impressive speed. As of November 2021, there were 5G deployments in 112 countries. According to Speedtest by Ookla, the median global 5G download speed in Q3 2021 fell to 166.13 Mbps, but this was a relatively normal occurrence as new mobile access technologies typically slow down as their adoption scales.

The countries of emerging Europe can profit from 5G technology greatly. As network capacities go up along with increasing bandwidth, it becomes possible to support more devices simultaneously. This is of particular significance to IoT products as the number of integrated devices will increase overnight with the adoption of 5G and provide a much-needed boost in the times of e-governance. According to estimates, 5G will be able to support as many as one million devices in a one-square-km radius, a considerable increase from the preceding 4G generation of mobile networks which can support no more than around 2.000 devices in that same area.

In a similar vein, 5G networks with their much faster speeds are expected to impact businesses in a major way by offering them amounts of data previously unheard of. Capable of providing 10 gigabytes per second, 5G is exactly



100 times faster than 4G which can only reach a maximum speed of around 100 megabytes per second. Needless to say, this fact will have a maior bearing for companies around the world as their production capacities will skyrocket as a result.

It must also be noted that 5G infrastructure is more affordable than its predecessors, therefore offering a much larger payoff. According to estimates by the European Investment Bank, 5G technology will reduce energy consumption by between 50 and 95 per cent. This will likely prove to be a liberating factor for a number of energy-dependent economies, for

instance in the developing countries of emerging Europe, as it will make these countries less reliant on some of Europe's most dominant energy producers.

As of early 2022, Moldova, Kosovo and Kyrgyzstan are the remaining countries in the emerging Europe region with no 5G infrastructure of any from. The Covid-19 pandemic provided a major setback for a more widespread adoption of 5G in other parts of Europe, with Ukraine, Belarus and Serbia postponing their 5G rollouts for the time being.

Many countries of emerging Europe have found themselves caught in the crossfire of a long-



running trade war between the United States and China. Protective of its zones of influence, the U.S. seems deeply concerned about the rising influence of China in areas which, historically speaking, have been America's economic playground. Consequently, the U.S. has banned American companies from buying hardware from Huawei the Chinese telecommunications giant. Meanwhile, Czechia and a few other countries in emerging Europe have expressed their concerns that Chinese-made 5G networks may potentially come with an added feature of spying on European countries.

The situation presents a considerable political and economic dilemma for emerging Europe countries. Huawei offers much

lower 5G installation rates than its European competitors, most notably Orange and Telia. Since much of emerging Europe has strong ties with the United States, European governments find themselves forced to choose between keeping their powerful ally in America happy and saving money with lower rates offered by China and Huawei.

By pressurising its European allies, the U.S. effectively slows down widespread adoption of 5G technology on the continent. Among emerging Europe countries. Poland. Czechia. Latvia. Estonia and Romania are signatory states of 5G security memoranda with the United States. While none of the agreements mention this explicitly, it is commonly understood that Huawei is the main target and the



reason behind these memoranda. 5G has also been the subject of conspiracy theories and disinformation campaigns, some of them incredibly claiming that 5G towers are responsible for the rapid spread of Covid-19. Such rumours, nonsensical as they will sound to most, may also come to slow down the rollout of 5G technology across Europe.

All these problems notwithstanding, the 5G revolution is already taking the world by storm and will not be stopped. According to estimates, there will be 1.7 billion 5G users globally by 2025. As of today, 5G clearly figures to be one of the factors that will continue to accelerate our technological advancement in the coming years.

PUBLIC CONCERNS A TOP CHALLENGE FOR RPA IN **EMERGING EUROPE**



ble to provide solutions to some of the most important challenges of large businesses in terms of their efficiency, Robotic Process Automation (RPA) is one of the world's fastest-growing industries these days. According to Deloitte's 2021 Global Outsourcing Survey, 72 per cent of respondents implemented RPA in their sourcing arrangements. The trend is clear: Robotic Process Automation (RPA) is an ever-greater driving force in outsourcing solutions.

The idea behind RPA is to allow employees to focus on activities that have higher value and importance by using process automation software to eliminate the need for repetitive tasks to be handled manually. According to AlMultiple, 53 per cent of enterprises have already started their RPA journey as of Q1 2022. Previously, Gartner reported that around 40 per cent of large businesses would start optimising their workflow with RPA software by the end of 2020.

Prior to the start of the Covid-19 pandemic, spending on robotics and related services in emerging Europe was expected to exceed 4.2 billion US dollars in 2020 alone. And yet, public attitudes remain negative.

According to a 2017

Eurobarometer opinion 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 were against automation, one of the highest percentages in Europe.

In spite of these negative attitudes towards it, automation certainly comes with a range of potential benefits for the countries of emerging Europe. With low fertility rates and demographic decline continuing to plague the region, automation is one way of addressing employee shortages that more and more companies have had to deal with.

The nations of the Visegard Four, i.e. Poland, Czechia, Sloviakia and Hungary, are expected to see a population decline of eight million people by 2050 at the current rate, or over ten per cent of the current combined population. In the meantime. Ukraine's population has declined by nearly a fifth since 2000. The consistent economic growth in the region paired with the shrinking labour force means that salaries are at their highest ever and unemployment rates are low. Automation is an effective response to these issues, especially for countries which have been reluctant to turn to immigration to curb their labour force decline.

Automation also brings many benefits for workers in emeraina

Europe. As they take over the most monotonous, repetitive and hazardous tasks, robots and machines free up humans to do less physically taxing labour. Rather than necessarily replace human labour, they can be of great use in terms of making various jobs much easier for individual workers. On the other hand, automation will likely slow down the outsourcing industry, which emerging Europe has benefited so much from.

By raising productivity levels and addressing the labour shortage, automation can also drive the GDP growth. 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. And yet, Linet has struggled to



employ enough people as the unemployment rate in Czechia is among the lowest in the European Union. Slovakia and Slovenia were

leaders of innovation in robotics and automation in emerging Europe 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.

UiPath, a major player in robotics and automation focusing on software automation for big companies, was founded in Romania. The unicorn software company has a valuation of over 35 billion US dollars and has been actively searching for startups specialising in B2B software automation. UiPath offers a 50,000







US dollars cash prize and access to its expertise and network of clients. 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.

Meanwhile in Armenia, in recognition of the belief that automation can help countries counteract small labour forces and low natural resources. the government has announced an ambitious plan to equip 50 per cent of schools in the country with robotics labs. 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.

Automation does have its share of problems, especially the prevalent conviction across emerging Europe populations that automation will eventually deprive people of their jobs. The fear cannot be shrugged off by governments as unfounded as there are no guarantees that the jobs lost in manual fields will be replaced by jobs in other sectors.

It is also fair to assume that while automation will open up more jobs in the ICT sector, not every worker who loses their manual iob will learn how to code. The result could be increased stratification within the labour force with an aristocratic minority of ICT workers and an everincreasing number of people sucked into the 'innovative' yet precarious gig economy.

For all these reasons, it's crucial that governments should step in and take an active role in mitigating the externalities so that automation benefits the entire society rather than just business owners. Some of the measures governments could look at include retraining programmes for workers and stronger safety nets to support the temporarily unemployed.

All the challenges notwithstanding, automation can make products more accessible for regular people and working conditions safer and less stressful. Assuming we can learn how to implement it in a responsible way, RPA is bound to make our lives easier

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CHOOSING THE RIGHT PARTNER has never been more important

Emerging Europe speaks with Aleksandr Sheremeta, co-founder and managing partner of DataForest, a firm helping companies use data to make better decisions, about the surge in automation and the importance of corporate culture.

By Marek Grzegorczyk

That the Covid-19 pandemic has led to a big increase in the number of firms looking to digitalise and automate various aspects of their operations is no longer a secret.

Across the world, various reports and analysis have demonstrated that companies of all sizes have become all too aware that they could find themselves left behind if they do not embrace the digital revolution.

But according to with Aleksandr Sheremeta, co-founder and managing partner of DataForest, a Ukrainian firm helping companies use data to make better decisions, the knock-on effects of this trend could actually lead to a slowdown in automation, particularly in emerging markets.

"At the beginning of 2020 I read a McKinsey report which said that 65 per cent of firms were in the process of automation," he tells Emerging Europe.

"Now, that is up to 90 per cent. This is going to have a significant impact on the tech industry."

Sheremeta says that there is already an issue with the supply of CPUs and microprocessors, but that the biggest problem is likely to be a shortage of developers.

"Since automation took off there has been a surge in demand for developers. The cost of development is booming, because it is becoming increasingly difficult to find developers with the required amount of know-how. Everyone wants to be in IT right now because salaries are so high, but to reach the kind of level that serious firms need takes time."

In short, these disruptive changes in supply and demand for software engineers will have a deep impact on global markets. This disruption makes choosing the right partner more important than ever, and DataForest is well positioned to take advantage.

"You need to know who your partners are," says Sheremeta. "Are the developers you are working with as capable as they claim?"

With a client base that spans four continents and tens of countries, DataForest primarily serves Englishspeaking businesses, across all sectors.

"When you are working with data, and automation, the business sector does



not really matter," says Sheremeta. "The

process is the same across all domains." He gives an example of the kind of work in which DataForest excels: using data to optimise supply chains.

"A chain of pharmacies with around 2,000 branches came to us because they wanted to understand how they could make better use of the stock they had on hand." he says.

"So we created a model that showed them how to best distribute the thousands of different medicines they have around their stores, based on data analysis of where particular items were being sold."

But DataForest is about more than merely data, Sheremeta points out. He adds that the firm also takes care

of web development, using Python and React for custom marketplaces, SAAS, and in-house software tools.

"Working on automation we start from the data pipelines by collecting information or integrating with third party providers," he says, "Then we add the AI part and ultimately we wrap this all with a user interface to deliver web applications for internal or external customers. Last but not least comes the DevOps part, where we are experienced in cloud cost optimisation."

"By combining data science, web development and DevOps we are a good match for clients who are only starting their automation journey, and for those who are already on the way to business digitalisation."

Like his co-founders, Sheremeta's background is in banking: he was previously in charge of data analytics at the National Bank of Ukraine. He says that DataForest, which has doubled in size to 40 people over the past year, and wants to do the same over the next 12 months, looks more like a consultancy than a typical outsourcing firm.

As he succinctly puts it: "We are delivering services rather than just selling heads."

What Sheremeta feels makes DataForest stand out is its understanding of corporate culture.

"There are three elements: interaction, flexibility and results," he explains.

"We mix teams, so that they communicate better. Communication is so important in the work that we do but quite often, IT people are not always the best communicators. We create a culture that helps build relationships.

"Then there's flexibility. Our clients demand it, so we need to promote the same values within your own company. We expect our employees to be flexible.

"And as for results, they must be the driver of everyone in the company."

Sheremeta is optimistic about Ukraine's future as an IT destination, one that it is not just about outsourcing at low cost but a home of innovative start-ups such as GitLab, which held a successful IPO on the New York Stock Exchange's Nasdaq index in October.

He is enthusiastic about the Ukrainian government's attempts to digitalise the country and move it up the value chain.

"The country is changing," says Sheremeta. "We currently have around 220,000 IT specialists and the number is growing by about 25,000 each year: that's significant growth. We also see the impact of IT in the economy, in its share of GDP.

"What's really encouraging is that we are becoming an innovator, not just a workforce: Gitlab's IPO shows the potential. Start-ups here are on the rise because the infrastructure for them is there."

He says that Ukrainian cities are creating ecosystems, hubs, sharing knowledge. Firms are collaborating with universities: DataForest has its own programme for junior developers to leverage their knowledge.

"This is all a significant shift for Ukraine," concludes Sheremeta. "It shows what IT can do."



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There were 16,828 people in the sector in 2020 compared to 18,153 in 2019 and 16,414 in 2018, putting the overall share of ICT jobs in the country at around 1.4 per cent.

One worrying indicator is that ICT exports as a part of the Albanian GDP showed a downward trend between 2017 and 2020 (from 1.07 to 0.56 per cent). However, ICT value added as a percentage of GDP has remained stable, at around three per cent in the same period (3.12 per cent in 2020).

The start-up scene, while still described as in its infancy, has shown some potential with a number of new companies emerging. Gjirafa, the Albanian language search engine and video content and e-commerce platform, remains the country's best-known start-up, with 8.7 million euros of funding received to date.

Food delivery marketplace Baboon, which lets users order food from local restaurants, is another successful start-up from the country, with the total investment received standing at 250,000 euros. SoftMogul, a hotel management

start-up, is part of the Californiabased Plug and Play accelerator.

Local accelerator programmes exist too, for instance Protik and Oficina, although both these companies have reported trouble in securing financing. Other programmes and institutions like Garazh and Yunus Social Business share their knowledge, expertise and resources with up-and-coming ICT businesses.

On the education front, there were 1,787 ICT graduates in 2020, representing 5.4 per cent of all graduates in the country. Another 8,341 students were studying information and communication technologies in 2020.

Albania ranks 22nd on the IT Competitiveness Index, out of the 23 emerging Europe nations. Where Albania performs much better is in the number of IT graduates which, at 63 per 100,000 inhabitants, is the highest in all of emerging Europe along with Ukraine. Broadband speed in the country is some of the slowest in the region at 49.97 Mbps, while data costs are relatively high at 23.87 euros for a month of data.

66 64 **ICT GROSS SALARY IN 2016-22**



ICT EMPLOYMENT IN 2016-22



Albania is a country with a high potential for growth in the ICT industry. With a large diaspora that brings access to the benefits of developed countries, a median age nearly a decade lower than in the EU as well as high levels of university enrolment, Albania has the necessary human capital for ICT development. Since the fall of communism, business-friendly regulation has been adopted in Albania, allowing ICT services to become a large source of foreign income. In 2020 alone. Albania exported 72 million euros worth of ICT services.

Despite a small population,

In addition to businessfriendly regulations, the Albanian government adopted a Digital Agenda for Albania 2015-2020 in which it recognised developing the ICT sector as a priority. As a part of the policy, software development and production companies enjoy a lower rate of tax on capital gains - five per cent compared to the general 15 per cent rate.

Albanians employed in the ICT sector receive above-average wages (650 euros in 2020 in comparison to the national average of 432 euros), but these wages are still lower than in more developed CEE countries and in the EU. As such, Albania remains attractive for companies looking to outsource and lower their costs.

The number of employees in the ICT sector in Albania has remained relatively stable in recent years.

EXPORTS

	2016	2017	2018	2019
Export of ICT services (millions, euros)	^{114.2}	87.9	68.4	96.3
of which export of computer services (millions, euros)	 5.5 	20.3	37.6	 47.4



С

VERVIEW								
Population (million)	Employed population	GDP nominal (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	Inward FDI (millions, euros)			
2.830	1,243,321	12,957	4,579	231%	969			
Albania's position in international rankings								
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)			
66	64	48	69	39	31			





attractive because of the higher average gross wages than in the rest of the economy — in 2020 it was 942 euros compared to 364 euros, meaning that wages in the sector were 159 per cent higher than the average. As part of the tax incentive scheme for start-ups, employees pay a reduced flat personal income tax rate of 10 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 a total revenue of 922 million US dollars in 2018, which was 20.5 per cent higher than in 2017.

Start-ups are an area where Armenia is really strong. According to some estimates, there are over 500 start-ups in the country — 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. Vineti is another Armenian start-up to watch. A health-tech company that offers

a cloud service to simplify access to gene therapy and cancer vaccines, Vineti has attracted 47.3 million US dollars in two rounds of financing.

When it comes to education, Armenia is well-poised to create a strong ICT workforce. There were 5,388 IT students in 2020, and 1,137 graduates. Informal education also exists in the country, a fact best exemplified by the diasporafounded TUMO Centre — a remarkable centre of learning where children aged 12-18 learn coding, programming and design, all of it for free.

In the IT Competitiveness Index. Armenia ranks 18th. With a strong growth potential and rising ICT exports, there are many reasons for optimism. However, Armenia will have to solve the problems that typically plague countries with a low population such as low living standards. Nevertheless, Armenia was still able to reach one of the highest average annual increases in the number of people employed in ICT as well as those studying ICT.

EXPORTS**

	2016	2017	2018	2019	2
Export of ICT services (millions, euros)	156.4	187.3	213.1	233.7	2
of which computer services (millions, euros)	119.2	 146.6 	164.2	 198.4	2

** SOURCE: ITC, UNCTAD, WTO based on IMF statistics for 2016-2019 and estimated for 2020



OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
2.963	1,052,400	11,071	3,736	383%	103
	Armer	nia's position in	international rar	nkings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
32	55	-	81	59	69

ICT GROSS SALARY IN 2016-22



*estimate based on official data

ICT EMPLOYMENT IN 2016-22



Armenia is the ICT powerhouse of the Caucasus, owing to several historical factors. Under Soviet rule, the country was the USSR's technological research and hightech manufacturing centre. Fifteen universities were built during this time, providing a basis for a strong STEM education. More recently, the country's extremely large diaspora has been a source of funding, and the government has declared the development of the ICT sector as one of its main priorities.

After the end of the socialist period. Armenia found itself in a difficult situation as a small country lacking natural resources. In 2020 the government declared ICT a national priority, identifying the people themselves as the country's greatest resource. From 2014 onwards, the government has also given tech start-ups preferential tax regimes as well as eased 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. The Armenian ministry of education has set a target of having 50 per cent of schools equipped with robotics labs.

In 2020. Armenia exported 288 million euros in ICT services, representing around 2.6 per cent of the country's GDP. The relatively low exports are primarily the result of the country's small population. Like elsewhere in the emerging Europe region, working in ICT is

master's and doctoral





Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
10.119	4,876,617	37,303	3,686	436%	444
	Azerba	ijan's position in	international ra	ankings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
38	107	56	88	86	65

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Azerbaijan is a country that is slowly making its first steps towards creating a strong ICT sphere. Since 2016, the country has pursued a strategy of strengthening the sector and, by doing that, diversifying its oil-reliant economy. Since then, more than 10 incubators have been established, including the US-based Founder Institute. Still. to sustain growth, Azerbaijan will need to invest further in innovation and diversify its economy by supporting and catalysing entrepreneurship and research and development across a broad range of potentially successful economic activities in the non-oil sector.

When it comes to government policies, these have been aimed at improving the 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 — a boon to entrepreneurship and to those interested in ICT careers alike. Furthermore, because of this government initiative, two hightech parks have been constructed. They serve as incubators for up-and-coming ICT companies, as well as research and development institutes.

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



country.

export of ICT services.

of innovation policy, such as the Innovation Agency. Azerbaijan has made progress in developing digital government platforms and public sector innovation.

to improve its business climate, Azerbaijan still has a long way to go towards becoming a strong ICT nation. Troublingly, the volume of ICT exports has fallen since 2016 when 65.8 million euros of ICT services were exported. In 2019 it was 52.2 million and while exports increased in 2020 to 57 million. this is still below the 2016 level. Another worrying figure is the drop in the number of IT students, from 14,571 in 2016 to 10,200. The number of graduates remains stable. 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.

Azerbaijan has over 200 startups, the third highest number in the Commonwealth of Independent States. Most successful out of these is the free classified advertising app tap.az. Other start-ups to

EXPORTS**

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	65.8	58.7	l 66.9	52.2	
of which computer services (millions, euros)	7.0	 5.3	 5.7	 11.1	

** SOURCE: ITC, UNCTAD, WTO based on IMF statistics for 2016-2019 and estimated for 2020











higher-than-expected levels of average wage, value added and



57.0

11.4

0.17% % of GDP 2020 2019 2018 **ICT VALUE ADDED** 2.04% 1.80% 1.57% FUTURE OF IT REPORT 2022 | **EEMERGING EUROPE**

0.15%

012%



BELARUS

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
9.350	4,319,600	52,757	5,643	227%	1,223
	Belar	us's position in i	nternational ran	kings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
95	54	38	53	38	65

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Belarus is an underrated tech giant in the Eastern Europe region. It has managed to secure a reputation as a reliable and sophisticated environment for the ICT industry. Recent developments around protests against the country's long-time strongman Alexander Lukashenko have caused political instability, but for now at least, the situation is stable and doesn't appear to have affected the ICT sphere all that much.

The Belarusian government has over the years instituted many policies aimed at developing the ICT industry. The unveiling of 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. IT 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.

Since 2016, there has been a steady increase of the number of people employed in ICT — from 98.800 to 136.300. In that same period, the export of ICT services



has more than doubled from 1.05 billion euros to 2.37 billion in 2020. Belarus is also strong in R&D and outsourcing.

The messaging service Viber did much of its initial development in Belarus (and has a Belarusian 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.

The country's start-up ecosystem is strong thanks to the Minsk HTP. In addition to the massively successful Wargaming, some other start-ups to watch include the well-being platform Verv which has attracted 256,000 US dollars in funding and the photo-editing app Fabby which landed 2 million US dollars in funding. The unstable political situation did somewhat spill over into the start-up ecosystem, however. In March 2021, the government shut down the start-up hub Imaguru, reportedly over the

hub leadership publicly supporting the protests against Lukashenko.

In education, Belarus fares similarly to other countries in the region. Eastern Europe has always had quality education in tech and STEM, and Belarus is no exception. The number of IT students has increased somewhat since 2016.

In the IT Competitiveness Index, Belarus is ranked 15th. The country is very strong in terms of outsourcing, start-ups, and research and development. Export of computer services as a percentage of GDP is the highest in the region, number of ICT graduates – in the top- five of the region. At the same time, negative dynamic in education, a large payment gap between the ICT salary and the average salary in the economy dragged the position down. The success of Wargaming. which operates a globally popular multiplayer game with a large user base, is proof enough of the country's achievements so far. However, the unstable political situation, if not resolved, could end up hurting Belarus especially if it becomes even more isolated from the rest of Europe.

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	1,047.6	1,289.2	1,572.5	2,155.0	2,
of which computer services (millions, euros)	866.3	1,068.2	1,345.9	1,898.4	2



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Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
3.475	1,173,075	17,325	4,986	199%	325
	Bosnia and He	erzegovina's pos	sition in internat	ional rankings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 72)(2016)	Online Service Index (of 193)
82	68	62	73	26	104

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Bosnia and Herzegovina's ICT sector has been slowly but surely finding its feet in recent years. Despite the government being slow to recognise the potential of the sector, foreign investment, incubators, and education programmes have proliferated, speaking to the development of the sector in the country. As such, the necessary components for a robust ICT sector are slowly coming together. Nevertheless, the nation is hampered by its small size and lack of government support for the industry.

When it comes to regulating the ICT sector and enabling a business-friendly climate, Bosnia and Herzegovina still has a way to go. There is no special tax regime for the sector yet. Bosnia's unique federal structure, and the country's ongoing issues regarding the rule of law may mean that regulating the ICT sector is not the priority of its officials. Government investment in the ICT sector is low, estimated at around 0.04 per cent compared to the global average of 2.7 per cent.

Nevertheless, more and more people are employed in the sector, and like elsewhere in the region wages in the ICT fields are significantly higher than in the general economy. Around 1.6 per cent of the total number of employed was in the ICT sector in 2020. These figures are par for the course in the Western Balkans region. Given Bosnia's small population of around three million, there are only a little over 19,170



people in the ICT sector (compared with Serbia's 90,518) so this acts as a barrier on the growth of the sector. Market-wise, the most demand in Bosnia and Herzegovina comes from the public sector, as the country's many governmental agencies require both IT equipment and services. Foreign big names

such as Cisco, Microsoft, and Oracle, are present in the market. ICT exports have been increasing. In 2020, 196.4 million euros was exported in ICT services compared

to 123.4 million in 2016. The start-up ecosystem is still in its infancy. Few start-ups and ICT companies in general have made waves outside of their native country. Strides to improve this have been happening, however. 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 intensive training programme for the ICT sphere

Since then, companies like Kliker and Robokids have followed suit, offering programming, coding and robotics classes to children. In 2019, companies in the BIT signed onto a strategic document known as the IT manifesto which targeted

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	123.4	142.5	171.5	205.3	1
of which computer services (millions, euros)	58.7	83.2	101.1	137.6	1

careers in the ICT field by offering elementary coding and software classes. In 2020, there were 5,354 undergraduate students in ICT and 604 bachelor graduates. Another 616 were studying while 134 became araduates.

Bosnia and Herzegovina is ranked 23rd in the IT Competitiveness Index, which is the lowest of all countries in emerging Europe. Despite this, it is ranked the highest for the number of participants in the TopCoder competition. In order to make its ICT sector more competitive, the country will have to, according to the Foreign Investment Promotion Agency, restructure the education system, improve the business environment for the support of IT sector development through the establishment of an IT development council, change its legislation, establish funds and find ways to implement a range of tax incentives or subsidise certain activities.





BULGARIA

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
6.917	3,121,700	60,501	8,747	225%	2,124
	Bulga	ria's position in i	international rar	nkings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
35	47	49	56	23	47

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Even during the socialist period, Bulgaria was somewhat of an ICT hub in the Central European region. At one time, nearly 40 per cent of all computers used behind the "Iron Curtain" were Bulgarian-made. In more recent times, the country has continued along the ICT path by first becoming an attractive outsourcing hub in the early 2000s and 2010s. These days, however, like the rest of the CEE region, Bulgarian companies are starting to make waves internationally and the country is shedding its reputation for low-cost labour.

On the regulation front, the main advantage of Bulgaria is its flat corporate tax rate of only 10 per cent, making it very attractive for investors. One of the main obstacles that many companies face is the country's tight labour market and access to funds. However, the Bulgarian government seems aware of these issues and in 2021 Bulgaria introduced a start-up visa. Exact regulations of this scheme are not yet known, but the programme's goal is to attract third-country nationals and investors to the country. In February 2021, IT professionals were classified as essential workers and put in the priority group for Covid-19 vaccination.

Bulgaria's ICT sector is showing steady growth. Between 2016 and 2020 the ICT exports almost doubled from 983 million euros to 1.67 billion. Wages in the sector have also increased in this period — gross



emerging Europe.

the entire region.

(fifth), but the dynamic of

averages for the sector were 1,128 euros in 2016 and 1,665 in 2020. This is more than double the average in the general economy. The number of those employed in the sector has also increased, in 2020 there were 100,900 people in ICT jobs representing 3.2 per cent of the total number of employed in the economy. Bulgaria is also notable for having a high proportion of women in ICT — 27 per cent, which is well above the EU average.

When it comes to start-ups, Bulgaria has a bourgeoning scene that has started to attract foreign investment. Start-ups to look out for in 2021 include the agritech Nasekomo, which produces animal feeds from organic waste and has attracted four million euros in funding, and Payhawk, a fintech offering a "paperless corporate card" which has attracted three million euros in investments. Many other start-ups in the country are also thriving. Accelerators are also present on the Bulgarian scene, such as LaunchHub Ventures and Eleven Ventures based in the capital Sofia. Sofia and Plovdiv have also emerged as digital nomad hubs for the region.

EXPORTS**

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	982.7	1,018.2	1,245.3	1,627.7	1,
of which computer services (millions, euros)	661.9	651.3	848.4	1,133.1	 1,

** SOURCE: ITC. UNCTAD. WTO based on IMF statistics for 2016-2019 and estimated for 2020



ICT EXPORTS

🔊 🗢 Scalefocus 🚥 🛛 Page 🎟

IT IN BULGARIA The emerging and powerful tech ecosystem

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

Bv Plamen Tsekov



UNDER AND CHAIRMAN O ALEFOCUS, BOARD MEMBER OF AIBEST

ulgaria 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.

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 araduation.

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

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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.

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

The challenges of the future offer much 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 on the Global Technology and Business Services Summit in December 2020, Eastern Europe is the top go-to talent destination for enterprise buyers.

2020

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)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)	
4.036	1,657,355	48,999	12,139	147%	1,142	
	Croat	ia's position in i	nternational ran	kings		
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)	
79	36	40	43	10	52	

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22

3.1% 2.7

Percentage employed in ICT

Number of people employed in ICT





3.5% 3.5% 3.4%

3.6% 3.8%

Croatia is one of the underrated hotspots for ICT in the emerging Europe region. With a well-educated and multi-lingual population, and having taken advantage of its EU membership to develop its ICT capacities, Croatia is fast emerging as a hub of innovation and technology. Croatia ranks 19th out of the 27 member states in the European Union (EU) Digital Economy and Society Index (DESI) 2021. Sluggish bureaucracy puts somewhat of a damper on Croatia's attractiveness.

However, in recognising the importance of the ICT sector, the Croatian government has promised to simplify some of the procedures of which there are as many as 314 in order to run a business. So far, the country still doesn't offer a start-up visa or a special tax regime for ICT companies. This is especially worrying as the corporate tax rate is 18 per cent, which is relatively high. According to the most recent DESI reports, Croatia performs best in human capital and interaction of digital technology.

Despite these issues, it would be true to say that the Croatian ICT sector has flourished in recent years. Exports of ICT services went from 598.4 million euros in 2016 to 949 million euros in 2020. The number of employees in the sector has gone from 49,250 in 2016 to 55,567 in 2020. Yet the country does lag somewhat behind the rest of the Central Europe region. Countries like Bulgaria, Hungary, and Poland have



much higher exports and generally stronger ICT sectors.

One area where Croatia does pull its weight is in its start-up ecosystem. There are an estimated 139 start-up companies in the country. The most high-profile of them is Rimac Automobili, which has shown off the world's fastest electric car, beating out such automotive heavyweights as McLaren. But Rimac is not the only start-up worth following. Agrivi, the agritech company offering farm management software, has attracted significant funding so far and is emerging as a major player in its vertical. Worcon, a B2B marketplace for suppliers in the CNC machining industry, attracted 400,000 euros in 2021. Finally, there is InfoBip, the country's first unicorn start-up that has now been investing in other start-ups itself. Taken together, this is evidence of a start-up ecosystem with a high potential.

In education, given its relatively low population, Croatia is on par with the rest of the region — there

are 42 IT graduates per 100,000 inhabitants, which is comparable to its neighbours. On the informal education front, many hubs and other IT-related organisations have been offering coding bootcamps. In 2020, there were 1,691 ICT graduates and 7,257 ICT students.

Croatia is 13th on the IT Competitiveness Index, placing it in the middle of the pack in the emerging Europe region. Croatia is ranked the second in the region in EF English Proficiency Index and the third in E-Participation Index. The payment gap between the ICT salary and average in the economy is the third lowest in the region – only 142 per cent. Education, talent, and entrepreneurship are the country's strengths but in order to catch up with more developed ICT sectors such as the ones found in Bulgaria and Romania, the country will have to ease bureaucratic and tax burdens on corporations. Croatia's broadband speeds are somewhat low at 80.02 Mbps and the price of data is somewhat high at 22.37 euros monthly.

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	598.4	678.3	796.6	875.5	
of which computer services (millions, euros)	 455.9 	524.0	623.6	674.7	





Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
10.702	5,234,937	213,212	19,923	170%	5,509
	Czech	nia's position in i	nternational rar	nkings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
27	25	22	27	27	61

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Czechia is a country that has made impressive strides in its ICT sector. It ranks 20th in the world in for percentage of its GDP invested in research and development, and the ICT sector has capitalised on this. Czechia also remains cheaper labour-wise than Western European countries, giving it a competitive edge over its neighbours such as Germany. In recent years, Czechia has also seen the development of a strong video game industry as well as a surge in the number of startups operating in the country. Some of the most well-known software companies come from the Czechia. Antivirus giants Avast and AVG were both founded and headquartered in the country.

Regulations in Czechia around business and entrepreneurship are favourable and business-friendly. While the country does have a higher corporate tax rate than some other nations in emerging Europe at 19 per cent, it offers a start-up visa for foreigners. The benefit of this is evident already as 20 per cent of start-ups in the country have been founded by foreigners. Czechia also offers ICT work visas to foreign experts from selected countries, including the IT powerhouse Ukraine. 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 the GDP, and three per cent of



and become players on the

In the IT Competitiveness

international market.

graduates.

94.15 Mbps.

the GDP in 2030.

The work and start-up visas help with the country's high demand for ICT labour. Although the country does have a large number of specialists (180,085 people in the sector in 2020 representing 3.4 per cent of the workforce), demand for them is increasing. Where this growth is blatantly obvious is in the dizzying increase of ICT exports since 2016 — from the already strong 2.9 billion euros to 4.6 billion in 2020. These are not surprising figures given Czechia's long history of innovation. The country has had an automotive industry for over a century, and is also the homeland of the inventor of contact lenses.

This strong tradition of technical proficiency and innovation is now evident in Czechia's start-up ecosystems. There are an estimated 900 start-ups in the country, with particular concentration in the gaming, entertainment and travel sub-sectors. Czechia is the home of the development studio Illusion Softworks, known for the open world action game Mafia, as well Bohemia Interactive, the makers of the globally popular multiplayer shooter ARMA. As with many CEE countries, the VC landscape is not as

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	2,936.1	3,394.9	3,612.8	4,108.5	4,
of which computer services (millions, euros)	2,314.4	2,603.2	2,847.2	3,435.2	3





Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
1.329	656,600	27,167	20,435	283%	2,763
	Eston	ia's position in i	nternational ran	kings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
8	21	8	29	22	2

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Since independence in 1991, Estonia has taken major strides towards 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. Nowadays the nation boasts Europe's highest number of startups per capita, more than four times higher than the European average. including international behemoths Wise (formerly TransferWise), Bolt and, of course, Skype — have been set up in Estonia. Furthermore, Estonia has the distinction of hosting seven unicorns companies that reach a valuation of over one billion dollars. This is all in a nation with a population smaller 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 Wi-Fi covering most of the country. Between 2002 and 2009, over 100.000 Estonians were trained for free — by their government in



continue its meteoric rise.

of the registration process —

of the hassle of international

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 in 2021. These investments have paid dividends — now the ICT industry employs almost five per cent of the total number of employed in the economy 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 a 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 108 per cent increase between 2015 and 2020 and coming to

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	521.6	645.2	774.4	901.7	
of which computer services (millions, euros)	331.2	 462.8 	563.9	678.3	 7

tech.

in 2021.





BARIN: A solution for investors looking for diversified portfolios

Next, Barin wants to provide faster web development solutions to companies and individuals

arin is an Estonian start-up whose main business model is buying internet assets (be they web pages, apps) and monetising their traffic.

One of the firm's three founders is Toms Bethers, who tells Emerging Europe that he met co-founders Alex Meleshko and Vadim Nester "by chance".

"We all had vast experience in the industry, but every one of us came from a different angle. We started talking about the advertising revenue on the market and realised that with an earn of 50 per cent it was a great business model to pursue," he says.

"With our common knowledge we thought that we can help others invest too. So we started working together -Vadim took care of the technical aspects of the project, Alex was in charge of all things SEO and I took over the whole business side of making the start-up into an actual business where everyone can join and earn with us with internet advertising."

The Barin team now comprises 11 professionals: developers, SEO specialists, copywriters, designers, and legal.

"We've been working in our field from around 2008 so I can say with confidence that we have great experience and knowledge of the industry.

We also employ a large number of freelancers for various projects," says Bethers.

Besides Barin.io, the team has also developed a successful independent business in advertising (SMM), marketing, web development, and e-commerce.

"What we are offering is a chance to be an investor and earn from advertising revenue without needing any prior knowledge.

"Our investors do not need to do deep market research, as all the work has been done from our side. They can just collect the 25 per cent yearly dividends from their initial investment."

How the business model works Bethers says that by taking advantage of a booming market, driven by a rise in internet use brought about in part by the Covid-19 pandemic, Barin has built its business around purchasing existing sites with advertising revenue, and then improving them in order to grow revenue and earn more.

"Through our channels and exchanges, we are looking for websites with positive dynamics of traffic and advertising revenue," he says, adding that Barin is only interested in sites that have been active for at least two years. "After that we study technical input, how transparent income data is and so on.

"We buy websites and applications that pay off in two years. This means the revenue-generating capacity is about 50 per cent per annum. We share half of the returns with our clients, leaving the other half to ourselves – to improve and maintain our websites as well as acquire new ones.

"We modernise the websites and applications we acquire on a regular basis, attracting additional traffic."

The purchase of websites is made through exchanges which act as a guarantee for the two parties: the seller and the buyer.

"It's fairly simple: we confirm the position for the purchase of the website, the exchange freezes funds equal to the cost of the website and at that moment the seller contacts us and starts to provide access to the website (most important of all — the domain).

"After the data connection is completed, both parties notify the exchange of this - and it finalises the payment. At this point, the acquired website is officially ours. After buying the site, our SEO team starts work and we carry out optimisation and efficient, lowcost improvements. After that continues the day-to-day work with the asset and advertisement."

Diversified investments

Barin claims that its main advertisement income comes from the Google and Yandex ad networks, and payments to investors are made every month.

Bethers says that Barin appeals to investors who want a diversified investment that allows them to achieve their financial goals and to make another source of income.

"What we offer is steady, transparent, and pays monthly dividends."

Bethers admits that in a market so full of investing options, projects, and platforms, it was hard to get to the top and be seen next to others.

"One of our biggest leaps happened in Stockholm, where at a blockchain conference I had the opportunity to talk with PWC representatives and showed barin.io – they liked the idea and had some comments about improving our project.

"So, I went back to the office all inspired by our talk and made some changes to the business model. After about three months PWC reached out and told me that they would like to nominate Barin for the Emerging Europe awards in the category Innovation Initiative of the Year. I went to London for the awards ceremony, had an amazing time, made new contacts. That was a push we needed at that time in order to expand our business and do more." Future plans

Bethers says that the pandemic wasn't a big factor influencing Barin's goals and revenue. He says that some of the start-up's asset traffic did fall but that in a very short period of time, "we successfully managed to get the traffic back, and now it has grown exponentially. Of course, we had some challenges with remote work at the beginning and some of the team members also got sick. But everything went fine, we have adjusted. I want to say a big thanks to my team for being patient. Indeed, if anything, the pandemic has made us more united."

Next for Barin is white label projects. "Our main plan is to provide some faster solutions to companies or individuals in web development. I can't discuss details at the moment, but we are excited about our idea and hopefully, we will present them next year.

"At the moment we are going through the process of buying two new assets. It's a bit longer than we expected but this could be one the largest purchases in our company's history, so we are being very careful and thorough with it. We hope to finalise this by the end of the year."

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The reader should not construe any such information or other material as legal, tax, investment, financial, or other advice as risk is fundamental to the investment process and has to be understood individually by each and every investor before making an investment decision. "More and more people are looking for smart ways to build their wealth. Diversified investment will allow you to achieve your financial goals and provide you with another source of income. We at barin.io offer easy investing, diversification and monthly dividends. Build your future now!"

Toms Bethers CEO & Founder of Barin.io





Luise tn 4-46, Tallinn Harjumaa 10142 info@barin.io



850,000 euros in funding.

region.

531 euros in 2020.

an impressive growth since 2016 - from 50.8 million euros to 100 million euros in 2020. Still, this is only 0.7 per cent of GDP, meaning there is a lot of room for growth. In 2020, there were 19,717 people employed in the field, a drop since 2016 when the number was 21,758. According to Stack Overflow, there were 8,100 developers in 2019.

The start-up ecosystem in the country is still developing but there are reasons to be optimistic about its future. 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-andcoming 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 operates a Growth in Georgia programme providing funding to innovative businesses in the country. Start-ups to watch include Pulsar AI, which uses AI to help car dealers communicate with prospective buyers and has already secured 1.2 million US dollars from Silicon Valley investors. Appidea is

EXPORTS

	2016	2017	2018	2019	2
Export of ICT services (millions, euros)	50.8	l 79.6	71.6	l 101.7](
of which computer services (millions, euros)	6.5	 35.5	36.0	 55.9	

GEORGIA

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	 F DI Inflow (millions, euros)
2 2 2 2 2 2			<u>en</u>		
3.729	1,241,825	13,913	3,732	333%	540
	Georg	jia's position in i	nternational rar	nkings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
12	53	66	61	50	92

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



*estimate based on official data

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

The commitment to jumpstarting a strong ICT sector is most obvious in the policies the government has adopted to incentivise entrepreneurship and make doing business in the country easier. Georgia has also taken steps to make investing easier. Registering a company takes only a day making it one of 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.

As the ICT industry in Georgia is still in its beginning phase, there is a lack of reliable data on how many ICT companies operate in the country. However, when it comes to ICT exports, they have recorded





HUNGARY

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
9.731	4,460,463	135,715	13,947	168%	3,650
	Hunga	ary's position in	international rai	nkings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
55	42	36	40	17	55

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Despite its small population, Hungary is fast emerging as a regional ICT hub and is becoming a real player in the European and global markets. Given the country's strong tradition of science and innovation, this shouldn't come as a surprise. Hungarian-born John von Neumann played a large role in the Manhattan Project and the country is also the site of the invention of the floppy disk, birthed by investor Marcell Janossi. Since the fall of communism, the county has quickly developed with the 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 is an excellent place to start an ICT business as the special corporate tax rate for the sector is only nine per cent and is among the lowest rates in all of the EU. Business registration is fast and easy — it only takes four to five business days. In Hungary, new companies also have the option of registering a virtual office, which 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 Al industry, projecting that by 2030 this would account for 11-14 per cent of the GDP.



ICT contributes around 10 per cent to Hungary's GDP, and the country has been in the EU since 2004 giving it completely unimpeded access to European markets. Hungary is a regional leader in computer assembly and communications equipment manufacturing. Exports of ICT services have been steadily rising from 1.7 billion euros in 2016 to 2.41 billion euros in 2020.

Given the overall strong performance in the sector, the start-up ecosystem's development is not surprising. Hungary's birthed a unicorn start-up — Prezi, the presentation app. In 2018, the number of start-up investments doubled compared to the previous year. Some start-ups to watch include SEON, a fraud detecting solution that has attracted 1.6 million euros in financing. Pénetech is a fintech company from Hungary that offers solutions for digital factoring which has landed 720,000 euros in funding in 2020. 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

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	1,741.4	2,159.8	2,372.1	2,512.5	2
of which computer services (millions, euros)	1,584.7	1,856.9	2,070.2	2,248.9	2

financial support, workshops and training to innovative start-ups, particularly with young or female founders.

In education, Hungary is a powerhouse. There were 23.653 students and 3,473 graduates in 2020. The number of students rises on average by six per cent a year, which is the fourth highest figure in the region. The number of graduates rises gradually with an average increase of 4.6 per cent a year. The quality of ICT education seems to be fairly high as Hungarian developers earned the seventh best result in the region on the first stage of the Google Code Jam competition in 2021.

In the IT Competitiveness Index, Hungary is ninth. Hungary is ranked the highest in the region in the ICT Regulatory Tracker Index. It is also the second highest in terms of the speed of broadband internet. In overall components Hungary is ranked high enough in for IT Infrastructure – sixth highest, while it's only 21st in the Economic Impact section due to the relatively low increase of export, value added and output of the ICT sector.





BLACKBELT, PROVIDING VALUE-ADDED SERVICES **THROUGH INNOVATION**

For years, Hungary's IT sector was limited to outsourcing. Today, things are very different, with innovative firms such as BlackBelt leading its charge up the value chain.

By Marek Grzegorczyk

🗖 lackBelt is a Hungarian tech company that works on nearshoring, development services and consulting. The company is a turnkey solution in team augmentation, delivering a complete team, technical support, as well as leadership.

Established in 2013, BlackBelt now employs around 230 people, bringing together experts with the most exciting IT projects.

The company works with multinational corporations in Hungary as well as North America and Western Europe, and says that its mission is to provide value-added services, make basic technology innovative and employ young talent across the country.

A bright future for Hungarian IT According to András Wolf, co-founder and sales officer of BlackBelt, the firm's biggest sectors of activity have long been software development and team augmentation. However, he says that during the Covid-19 pandemic, custom and low-code development started to take over

Low-coding applications are designed in a visual way, where instead of handcoding, workflows and screen designs are prepared, and apps generated automatically, at the push of a button, based on the visual design The approach democratises

application development, so that even those without any tech education can easily adopt it. "This is the trend," Wolf tells Emerging Europe. "Lowcode

has been emerging, and I believe that it will take over the flag of the company as well as becoming prevelant on the global market in two years."

According to Wolf, the IT sector in Hungary has a "bright future" and will become more important as, unlike others, it has not been significantly impacted by the pandemic.

"On the contrary, this market has been in a verv good state.

"Working on software robotics is our main goal, and digital business automation is in the same combination with low-coding, it is in the same bubble," he adds

Value-added services Hungary was viewed as a low-cost

outsourcing destination. However, in recent years, the country has been increasingly forging a reputation as a place where innovation is also happening. Indeed, Wolf says that Hungary

is no longer a low-cost outsourcing destination. "High-quality, value-added work is now being done here." He says that the name of the

company, BlackBelt, was adopted to emphasise the company's focus on quality and high standards. "We love to say that we have

colleagues with blackbelts. It's a sign of quality for us." he explains. Wolf adds that the firm is a turnkey solution, which provides value-added

services and proposals. "We are able to build up an R&D

centre for any company. We have experience and we have done that many times. Today, Hungary is already a destination for a lot of projects," he says. Returning to the rise of low-code.

he adds that BlackBelt are "pioneers" in the field. "We have our own lowcode platform and we also represent Mendix, the world's biggest provider in developing mobile and web applications."

Reiterating the idea that Hungary is no longer a low-cost country, he adds that "we are not a low-cost outsourcing company. We are able to deliver a good package of knowledge, technology and IT. We are in the middle on the market." Innovation

BlackBelt is an innovative company, which focuses on finding innovative and creative solutions.



"We have an innovative operating board, focused on changing approaches, technology and the mindset of our clients. We help our clients to save money and time through innovation. I think it's an added value as well," says Wolf.

"We always concentrate on the channels, how we are able to find new ideas, what we are able to convert into innovation," says Wolf. "We innovate at deep technology level - low-coding is such an innovation. We understand technologies to their core. We want to reform software development, working with the best talent "

Finding fresh talent in the country is also one of the most important facets of the company's push towards innovation. That's why BlackBelt collaborates with the prestigious Corvinus University of Budapest.

"We are a partner of Corvinus University, through which we are able to reach them [voungsters] and try to understand how we can help them make a change. I think this is the most important aspect of our work," Wolf explains.

"We work with talent who have innovative ideas. We make presentations on how to innovate and try to develop their ideas. Of course, we are looking for innovation from inside the company from our talent, but we are channelling it from outside as well.



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www.blackbelt.hu

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
2 2 2 2 2 2					
18.756	8,732,040	148,692	7,928	336%	3,395
	Kazakh	stan's position ir	n international r	ankings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
34	64	54	51	96	11

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Kazakhstan is the most developed country in Central Asia, both in terms of the GDP per capita and the development of its digital services and e-government. As is the case with other countries in the region. Kazakhstan retains a strong Russian influence stemming from its history as part of the Russian Empire and later the Soviet Union.

Although Kazakhstan is the ninth largest country in the world, its population is only 17.8 million and distances between cities and remote villages span up to thousands of kilometres. The main challenges going forward will include creating an infrastructure that will reduce the geographical gap through the use of latest technologies. Many Kazakhs still live in rural areas where there is no access to the internet, and therefore increasing the internet penetration in the coming years will be vital to the country's economic development. Offering solutions to some of Kazakhstan's infrastructural problems is of great potential for investors, especially in the fields of eCommerce, fintech, data management and education.

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. The country ranked 96th in the EF English Proficiency Index in 2021, indicating a very low level of English proficiency.

In 2017, the government launched the Digital Kazakhstan Initiative with a budget exceeding one billion euros. The ambitious goals of the programme include digitising the economy, transitioning to e-governance, developing ICT infrastructure and stepping up ICT education in primary and secondary schools. As for Kazakhstan's higher education, our estimate shows that in 2020 there were 17,381 ICT students as well as 7,989 graduates.

The domestic market in Kazakhstan is growing but remains relatively small in global terms. The country's most profitable internet

market is eCommerce, but its estimated volume is a mere 700 million US dollars which pales in comparison to Russia's 18 billion US dollars in the same field or two billion US dollars in Ukraine. The leading companies in Kazakhstan's eCommerce market include air ticket seller Aviata.kz and online clothing store Lamoda.kz.

Nearly all Kazakh start-ups function only in the domestic market. The few start-up companies with significant success globally include Robo Wunderkind, a robotics kit for children, and Nommi, a 4G company.

In 2020, there were 159.670 specialists employed in the ICT sector, 1.8 per cent of total employment in the economy. The average monthly nominal wage in the sector was 617 euros in 2020, accounting for 137 per cent of the average salary in the economy which stood at 452 euros.

The export of ICT services amounted to 125 million euros in 2020, including 29 million euros worth of computer services. These figures represented a mere 0.08 per cent of the country's GDP, while the ICT value added as a percentage of GDP was at 2.38.

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	112.3	102.8	103.7	116.0	
of which computer services (millions, euros)	12.2	13.2	18.7	19.9	





KYRGYZSTAN

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)		
6.637	2,445,200	6,773	1,021	258%	-289		
Kyrgyzstan's position in international rankings							
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)		
78	82	-	120	101	82		

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



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. ICT is nevertheless one of the fastest growing industries in the Kyrgyz Republic.

In 2011, the government launched the High Technology Park of the Kyrgyz Republic in the capital city of Bishkek, modelling it on the High Technology Park in Belarus. It is a taxfree 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. The figure then slightly dropped to 13.7 million US dollars in 2020, a good result overall given the Covid pandemic.

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 expansion is the lack of trained IT specialists as well as the attrition of talented Kyrgyz developers to overseas employers. In the last several years, the Kyrgyz Republic has risen in the rankings of the Global Innovation Index from 117th in 2013 to



98th in 2021 among the 132 countries ranked, 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. The start-up scene in Kazakhstan is still in its infancy but there is a couple of start-ups already making waves internationally: MakeUseOf.com, a tech-oriented website with millions of hits monthly, and Mad Devs, a developer outsourcer with clients all across Asia and in the Silicon Valley.

While the Russian language, along with Kyrgyz, is a de jure official language in the country and is spoken by a grand majority of the population, in the 2021 edition of the EF English Proficiency Index Kyrgyzstan ranked 101th globally with a very low proficiency in English. It is estimated that in 2020, there was a total of 6,230 ICT students in the

country as well as 3,084 graduates. Estimates also show that about

30,800 people were employed in the Kyrgyz ICT sector in 2020, or 1.3 per cent of the total number of employed in the economy. The average gross salary for ICT specialists has been rising steadily in the country and stood at 397 euros in 2020, representing 185 per cent of the average gross salary in the economy, which is 214 euros.

On the other hand, Kyrgyzstan's ICT export data paints a less optimistic picture possibly related to the above-mentioned brain drain issue. The country's ICT exports formed 0.96 per cent of the GDP in 2016 but only 0.19 per cent in 2020, and in a similar vein the ICT value added as percentage of Kyrgyzstan's GDP fell from 3.49 per cent in 2016 to a mere 2.66 per cent in 2020. Exports of ICT services netted Kyrgyzstan 59.2 million euro in 2016 but as little as 12.9 million euro in 2020, 4 million euro of which that year were exports of computer services.

EXPORTS**

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	59.2	34.9	18.4	13.1	
of which computer services (millions, euros)	3.1	 2.4	2.2	4.4	1

** SOURCE: ITC, UNCTAD, WTO based on IMF statistics for 2016-2019 and estimated for 2020





Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
1.798	350,856	6,679	3,714	-	346
	Kosov	/o's position in ii	nternational ran	kings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
58	-	75	-	-	-

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Kosovo is Europe's youngest country, both in terms of its independence and population. As such, the ICT sector in Kosovo is still developing but it is showing signs of high potential. Forty per cent of Kosovo's population is under 25 years of age, and due to the circumstances of the country's creation most of the population speaks English. Kosovo has adopted the euro as its official currency, making business with European companies easier. Despite support from the EU and Western NGOs, the political situation in the country remains somewhat unstable with regular flare-ups of tensions with Serbia, which still does not recognise Kosovo's independence.

Kosovo's government has recognised the importance of the ICT sector and has adopted policies aimed at further developing the sector and making the business climate friendlier. Kosovo has a specific "innovation" ministry and has instituted a flat 10 per cent corporate tax. In 2020, there were 13,893 people employed in the ICT sector representing four per cent of the entire number of employed in the economy – a marked rise since 2016 when ICT employees were 2.2 per cent of the total.

This is no surprise given the importance of Kosovo's ICT sector for the larger economy. This sector is one of the few that records a positive trade balance. Some 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. In 2020, the export of ICT services netted 71.74 million euros, representing 1.07 per cent of the country's GDP. 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 the country's 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.

When it comes to start-ups, Kosovo's ecosystem is still very young. Several accelerators exist in the country such as the Innovation Centre Kosovo, fostering entrepreneurship and helping young start-ups get off the ground.

In ICT education, Kosovo shows the same trend as the rest of the Western Balkan region — more and more young people are deciding to pursue careers in the sector. In 2020, there were 12,367 students and 925 graduates. The latest year brought a significant rise in the number there were only 4,154 ICT students in 2019, so the gradual decrease from 2016 to 2019 changed by the sharp increase in 2020.

Kosovo is tenth in emerging Europe in terms of IT Competitiveness, climbing the highest among countries in the South East Europe region. In 2021, the average ICT wage was 697 euros. one of the lowest in the region. It is still, however, 150 per cent of the national average. Kosovo was ranked the highest in the Talent component in 2021 due to a sharp increase in the number of ICT students, graduates and employees in the ICT sector. The decrease of ICT wages has positively influenced the competitiveness of the sector, making it more attractive for international vendors.

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	48.4	46.6	55.8	67.2	
of which computer services (millions, euros)	13.1	 15.4	21.4	33.9	





KOSOVO'S IT SECTOR The diamond in the rough

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

By Marek Grzegorczyk

ack 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.

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."



CENTRE AND STRATEGIC INITIATIVE RAIFFEISEN BANK KOSO

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.

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 knowhow."

"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."

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.

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'."

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 aovernment is further trvina 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.





Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)		
1.893	893,000	29,334	15,494	222%	764		
Latvia's position in international rankings							
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)		
30	36	24	37	26	94		

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Latvia is another nation which has taken big strides since independence, particularly in the ICT industry. With an ultra-fast internet connection (146 Mbps as of December 2021), near-universal Wi-Fi in the capital of Riga, and 80 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 registered start-ups operate in the small nation, and they are 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 handin-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 business incubators in the country. These are institutions which provide funding, mentoring, quidance 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 chose to study ICT, 63 per cent of those were 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 (222). At the same time, Latvia scores lowest in the Baltics in the human development, social progress and economic freedom indices.

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	532.0	624.0	780.0	846.0	8
of which computer services (millions, euros)	298.0	 386.0	442.0	499.0	Ę





LITHUANIA

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)		
2.796	1,358,100	48,930	17,502	270%	419		
	Lithuania's position in international rankings						
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)		
15	34	35	34	24	24		

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



The largest and most populous of the Baltic states, Lithuania is another potential powerhouse 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 is an important start-up ecosystem in the Baltics: 1.021 operated in the nation as of 2020, almost as many as in Estonia. 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 earlystage start-ups. The country has also acquired a reputation as a hub for innovative fintech companies, ranking 10th in the world in the Global Fintech Ranking in 2021. 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 2020, Lithuania is ranked sixth globally, scoring some of the 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

EXPORTS

	2016	2017	2018	2019	
Export of ICT service (millions, euros)	s 299.1	489.5	555.5	679.8	
of which computer services (millions, eur	os) 234.8	373.3	455.3	575.2	

employed in the ICT industry in the region. Meanwhile, according to data for 2020, 20,804 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 quadrupled from 214 million euros in 2014 to 952 million in 2020. Lithuania generates more value added in the ICT sector than Latvia. However, it lags behind its neighbours in the PISA Mathematics index.

Lithuania ranks fourth in the IT Competitiveness Index. The number of ICT specialists is growing faster than in the neighbouring countries, amounting to 8.3 per cent on average from 2016 to 2020 and making up 2.9 per cent of the total number of employed in Lithuania as of 2020. 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.





MOLDOVA

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)			
2.597	834,200	10,430	4,016	278%	48			
	Moldova's position in international rankings							
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)			
85	66	55	90	36	52			

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22

4.5% 3.9% 3.9% 3.4% 3.0% 3.1% 3.2% Percentage employed in ICT 31,4, Number of people employed in ICT 2016 2017 2018 2019 2020 2021 2022 forecast

Moldova is in the midst of an ICT boom. According to former prime minister Ion Chicu, between 2017 and 2020 the turnover in the ICT industry multiplied two and a half times. This is a far crv 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 at just under 10 dollars monthly.

This growth has been fuelled by corporate law reforms, alongside initiatives to make the country's ICT companies more competitive. Since 2016, a part of those initiatives has been bureaucratic reforms, particularly for ICT companies. 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. Registered companies enjoy a lowered tax rate of just seven per cent, as well as access to funding, partnerships and the international market.

The reforms and incentives seem to be working, as ICT exports have increased in the last five years by 89.6 per cent. The country has exported 265.3 million euros worth of ICT services. Moreover, exports of computer services rose even more significantly – by 278 per cent in 2020 compared to 2016. The number of employees in ICT



sector remains stable - 30,247 in 2016 and 32.929 in 2020. Moldova is also 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 it access to vast markets in diverse countries, presenting an enticing growth opportunity. As a result, Moldova's ICT industry is heavily export-oriented: 80 per cent of ICT products are designated for the export market, with two-thirds going to Western Europe and the United States.

Start-ups in Moldova benefit from the free economic zones and the virtual IT park. 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 numerous sectors. Companies within the virtual IT park are also able to sponsor foreigners for IT visas, which can run for up to four years with the possibility of extension. Start-ups to watch include Fentury, a personal finance advisor app and the first winner of the Seedstars Chisinau and Terranet — an IT solutions business that has attracted almost three million US dollars in funding.

Moldova has some of the lowest numbers of ICT students per 100,000 inhabitants at 156. This is largely due to the country's severe brain drain issue in line with a decades-long population decline.

Moldova is ranked 17th in the IT Competitiveness Index and ranks high for the cost of data only 8.73 euro for a monthly plan, which makes it the third highest in the region. The average speed of broadband internet is the fourth highest in the region. Despite having a small number of students and graduates, the dynamic is positive – it increases by 4.7 and 6.8 per cent a year respectively. However, Moldova is not doing great in the sense of the economic development of the sector - wages are rising by 16 per cent annually, but the total value added of the sector only by 0.3 per cent a year. The country has a lot going for it a government clearly focused on growing the ICT sector and trade agreements with both the EU and CIS countries, giving it excellent access to both markets.

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	139.9	155.5	190.8	231.7	l 2
of which computer services (millions, euros)	59.9	90.5	130.8	180.7	 2



MOLDOVA'S BEST4U: Extended teams for start-ups worldwide

For companies looking to expand their workforce, outsourcing and outstaffing have long been the traditional options. But one Moldovan start-up is challenging the status quo with a new model it calls extended teams.

By Marek Grzegorczyk

ounded in 2019, Best4u is a start-up based out of Moldova that in its own words aims to connect great talents with great partners, and the way the firm has chosen to do so is by disrupting the current outsourcing and outstaffing models

Central and Eastern Europe has long been a region where outsourcing models have flourished. Romania, Bulgaria, Ukraine, and Moldova are all countries that are popular with foreign companies looking to increase their workforce while lowering their costs.

But according to Serghei Covali, the CEO of Best4u, there are downsides to the traditional models. Namely, that there can be a culture mismatch between "the home and away" teams.

It's this issue that Best4u is attempting to solve.

"What we did is — we don't rent a team for a certain project or amount of time," Covali tells Emerging Europe.

"We actually build within our company a team for our partner. We also help them grow and align to the cultural values of our partner companies."

In essence, while the teams are employees of Best4u in Moldova, they are tied to a single company and the start-up goes to great lengths to help integrate these teams with the company it provides work for.

That means that while the team may be located in Moldova, they are for all intents and purposes treated as a team member of the company that retains Best4u's services.

"We also let them [the companies] have their own policy of salary growth or on how you take holidays, of course aligned with legislation in Moldova. Basically most of the things they have in their HQ is aligned with the extended team they have here," Covali notes.

While in traditional outsourcing, actual workers may not share the goals and visions of the company they provide work for, with the extended team model things are different.

"Many product companies choose the extended model over outstaffing — it's your own people and your own company, so of course they will be focused on your own goals. I would call this the biggest advantage above everything," Covali explains.

In the beginning however, it was hard to convince people that the new model could work. After all, outsourcing is one of



the pandemic, but the unprecedented situation accelerated the pace of change "The pandemic helped us expand our

more companies. Companies started to believe more in people, in this bond and attachment between employee and employer. Since then we have doubled the number of clients, and the number of our developers." Covali notes

boost in client numbers what's next for

employer in Moldova.

become the best employer under the roof of Best4u in Moldova. To offer the best culture, the best work conditions, the best coworkers and the best work-life balance" he concludes



product and helped to get in touch with

So, after these success stories and a

Covali says it's to become the best

"We want all of our partners to



EXTENDED TEAMS

Extend your software development team in Moldova, eastern Europe IT market

Interesting moments about Best4u International:

✓ Founded in 2019

The new era of business requires the need for **an alternative** to traditional outstaffing and outsourcing. Employees want and need to feel valued: when you're part of a team and feel cared for, you become more grounded and secure.

Best4u International comes with EXTENDED TEAMS solution!



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SERGHEI COVALI CEO, BEST4U INTERNATIONAL

the most established forms of contractual

work in the market, and has been for

company soon had a much better

However, according to Covali, the

problem — how to actually filter those

"We are guarded in what we do,

because we don't want people we hire

to work with a company which actually

wants outsourcing or outstaffing. What

we do is different and we are very picky

can benefit most from extended teams.

"We helped these companies' grow

and after two and a half years they are

still with us, they are still growing, some

of them having already hired their sixth of

Companies that offer services related

Several already work with Best4u.

seventh person here," he explains.

to remote work have typically seen

and Best4u is no exception. As the pandemic related measured forced

success during the Covid-19 pandemic

According to Covali, it is start-ups that

in whom we will choose to work with,"

who are interested in working with them.

decades

he says.



\checkmark 100 developers **18 partners**


MONTENEGRO

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
0.621	219,400	4,193	6,755	251%	463
	Monten	egro's position i	n international r	ankings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
80	57	53	48	-	102

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Montenegro, one of Europe's youngest countries, has taken significant steps towards creating a strong ICT sector. Since declaring independence in 2006, the country has pursued closer ties with the western world and an EU membership. It joined NATO in 2017, which has strengthened its cybersecurity capacities. Nevertheless, after the latest elections in 2020, there has been a level of political instability and a worsening relationship with Serbia.

In 2018, the country unveiled plans to build a science and technology park in the capital city of Podgorica. Construction is expected to conclude in 2022, and once completed the park is meant to serve as a hub for the ICT sector and the centre of the start-up scene in the country. Currently, some 400 companies operate in the sector, primarily in software development. International heavyweights like Microsoft, Telenor and Deutsche Telekom all have offices and research centres in Montenegro.

Montenegro's main drawback is its small population, and therefore a small actual number of ICT experts. In 2020, there were 5,400 people in the sector, representing 2.5 per cent of the total employed population. As such it has the lowest ICT exports in the region, at 61.7 million euros. Nevertheless, Montenegro's results are similar to Albania and Kosovo despite these two countries having significantly higher populations and a larger ICT workforce pool.



Like in the rest of the South East Europe region, working in ICT is attractive due to a significantly higher average wage. In 2020, the average gross wage was 1,047 euros, compared to the national average of 783 euros.

Few start-ups from the region have made waves internationally, as the country's start-up scene is still developing. This is one of the areas that the eventual opening of the Podgorica science and technology park is meant to address. However, initiatives aimed at developing the sector are underway and the potential is there. According to RS Components, the country ranks second in the region in entrepreneurship-mindedness. Local start-ups such as Amplitudo hold training programmes for elementary children, preparing a new generation of ICT specialists. Amplitudo also founded Digital Den, the first incubator in Montenegro. Another private initiative, the Montenegrin Business Angels Network (MBAN) has trained 3.500 civil servants.

Education-wise, Montenegro has what it takes to educate IT experts — five faculties in the country teach ICT subjects. There were 1,344 students in 2020 and 240 graduates. In IT Competitiveness, the county ranks 20th. The Montenegrin

government does recognise the

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	54.9	54.5	68.7	56.3	
of which computer services (millions, euros)	11.5	 12.7	19.8	29.5	

taken steps to improve it. At the same time, Montenegro is ranked third in the region for the annual increase of export of computer services – 36 per cent a year since 2016. The payment gap between the ICT sector and the economy is the second smallest – only 34 per cent of the national average. At the same time, wages do not show positive dynamics, which contributes to the competitiveness of the sector. Montenegro has harmonised its regulations with the regulatory framework of the European Union and the EU's policies and regulatory solutions, providing investors with a stable investment environment. Medium-term programme goals of the government include creating conditions for a dynamic development of new generation networks, continuous improvement of e-services, widescale application of ICT in the work of public administration and the society as a whole. Despite that, these improvements should be implemented on a larger scale as Montenegro lags behind in the Online Services Index and E-Participation Index.

Montenegro has good broadbands speeds, the second highest in the region at 78.6 Mbps but the data cost is high at 22.95

euros per month.



NORTH MACEDONIA

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
2.069	794,909	10,737	5,190	183%	240
	North Mac	edonia's positio	n in internation	al rankings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
46	63	67	82	-	58

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



In North Macedonia, the ICT sector is the fastest growing segment of the economy. Despite somewhat lacking real governmental support, the sector has organically grown in the last few years, recording a significant trade surplus. As such the sector is a reliable source of both foreign currency and employment. Like other countries in the region, North Macedonia's greatest competitive advantage lies in the mix of a lowcost yet highly skilled workforce.

Similar to other countries in the region, North Macedonia has a very favourable corporate tax rate, at just 10 per cent. There is no special tax regime for the ICT industry, but the low tax rate combined with easy company registration, which takes only 24 hours, means the business climate is friendly. On the other hand, the low taxes do somewhat deprive the state of tax funds that could be used to invest in the ICT sector. According to the Macedonian Chamber of Information and Communication Technologies, in 2020 there were 1,957 active ICT companies operating in the country, pulling in a total revenue estimated at 880 million euros, which is a 17 per cent increase since 2016.

When it comes to the tech sector figures, North Macedonia is faring similarly to the rest of the Western Balkans region. In 2020, there were 18,481 people employed in the ICT sector, representing 2.3 per cent of the total number of all people employed in the economy.



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



POLAND

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
38.265	16,441,500	520,195	13,595	220%	8,825
	Polar	nd's position in i	nternational ran	kings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
41	35	10	35	16	22

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22

2.2% 2.5% 2.6% 2.7% 2.8% 3.0% Percentage employed in ICT 130,500 409,250 379,000 Number of people employed in ICT 2016 2017 2018 2019 2020 2021 2022 forecast

Poland is emerging Europe's ICT powerhouse. Ten unicorns, an incredibly strong gaming industry that has birthed global phenomena such as The Witcher and This War of Mine. a dizzving rise of ICT exports. Poland has shot past the emerging market category and is now playing side by side with the world's heavyweights. An EU member since 2004, Poland has successfully 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 worldwide.

When it comes to regulations, Poland does have higher corporate taxes than some other emerging Europe counties at 19 per cent. According to Global Business Complexity Index, Poland is second in Europe in when it comes to the complexity of doing business as legislation sometimes changes quickly without giving companies enough reaction time. Nevertheless, given that a strong economy such as Denmark is actually ranked first in this index, so this shouldn't discourage potential investors from choosing Poland.

Regulatory complexity hasn't stopped Poland from being the biggest exporter of ICT services in all of emerging Europe. From just shy of 4.8 billion euros in 2016, exports rose to 8.2 billion euros in 2020. Poland also has a large talent pool



of ICT employees — 445,750 of them, successful and well-funded startor 2.7 per cent of the total number of employees. One of the strongest sectors in ICT is gaming. Companies like CD Projekt and 11 Bit Studios have put the country on the global gaming map, while a bourgeoning number of mobile and indie developers as well as companies offering gaming-related services such as digital 3D animation round up what has become a mature industry segment, with more gaming companies listed on the Warsaw Stock Exchange than on its Tokyo counterpart. Around 500 games are released annually from Poland.

Another area where Poland is excelling is its start-up ecosystem. In addition to the aforementioned unicorns such as Allegro and CD Projekt, many Polish start-ups have been making waves on the international scene. Funding is flowing freely into the country's start-ups and scarcely a week goes by without a new funding announcement. According to a recent report by PFR Ventures and Inovo Venture Partners, Poland saw a 70 per cent increase in start-up venture funding in 2020 at 477 million euros. Poland stands alongside Estonia as the region's most fertile breeding ground for

ups. There are dozens of incubators and accelerators for start-ups. The biggest of these is the Warsawbased Reaktor X. Start-ups are beginning to appear all over Poland. not just in the capital, and that's a particularly good indicator.

ICT education is strong in Poland with many universities offering programmes in computer science and related fields. Informal education is present too, with coding bootcamps in Warsaw and elsewhere. Poland had 67,019 students in 2020 in the ICT fields, second only to Ukraine's 109.439.

In the IT Competitiveness Index, Poland is second. An extremely strong start-up scene, the emergence of video gaming as a powerful vertical (400 development studios employing 10,000 people and generating 470 million euros of revenue) plus a high number of ICT experts are all in favour of Poland. The country is only hampered by its somewhat high taxes and the complexity of regulations governing business - in the Regulatory Quality Index Poland ranked only 19th in the region. In most parameters Poland is ranked one of the highest, but it actually holds the first position only in terms of the number of ICT employees.

EXPORTS

	2016	2017	2018	2019	2
Export of ICT services (millions, euros)	4,813.4	5,627.9	6,784.8	7,692.0	8,2
of which computer services (millions, euros)	4,013.5	4,753.5	5,700.9	6,666.9	7,1



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 By Paweł Pustelnik



olish 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-todate 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 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.



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AWARDS













ROMANIA

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
19.186	8,521,057	217,752	11,349	369%	2,033
	Roma	nia's position in	international rai	nkings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
43	45	52	49	15	61

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



For a long time, Romania has been experiencing a boom in the ICT sector. Parlaying strong STEM education into becoming an outsourcing hotspot, the ball was set rolling for the development of the ICT sector. 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.

The country has a favourable business climate with taxes at 16 per cent for corporations and no income tax for software developers. For years, the Romanian government, recognising the importance of the ICT sector, has given generous subsidies to up-and-coming businesses in the sector. Now companies also have access to VC funding, with companies such as Gap Minder setting up offices in the country. The Romanian Software Industry Association (ANIS) says that the local IT industry's objectives for Digital Romania in 2025 are for the ICT sector to reach 10 per cent of the GDP.

In 2013, the university city of Cluj opened the first technological park in Romania, the Liberty Technology Park. ICT exports in Romania have increased since 2016 significantly



from 3.38 billion euros to 6.16 billion in 2020. More than 192,000 people are employed in the sector, with wages growing since 2016, from 1,264 euro in 2016 to 2,035 euro in 2020. And yet, they remain below EU averages which makes the country very attractive for outsourcing.

Start-ups are another area where Romania is a strong regional contender. In 2018, AI robotics company UiPath became the country's first unicorn reaching an estimated value of over seven billion US dollars since then. There are two more unicorns in the country -Elrond, a block chain start-up, and eMAG, an e-commerce business. Other start-ups have also made international waves and attracted significant funding. In 2020, 58 start-ups raised 30.39 million euros according to Romanian conference How to Web. This represents a 51 per cent increase year on year.

Romania has a strong and very STEM-focused education system. Following the fall of communism and especially after the country joined the EU, this educational priority was what allowed Romania to first emerge as a hot outsourcing

destination and to now begin striking out beyond that into becoming an international player in ICT. In 2020, Romania had 39,458 IT students and 8,222 IT graduates which puts it in the top tier of emerging Europe countries.

In the IT Competitiveness Index, Romania is ranked sixth. A favourable business climate, strong start-ups and education are great things about Romania. On the other hand, Romania has had a longstanding issue with corruption marring its potential, the country ranking the third most corrupt in the EU in 2020 according to Transparency International's annual Corruption Perceptions Index (after Bulgaria and Hungary, respectively). While the country has the highest average broadband speed (235.63 Mbps) in the region, the cost of data remains one of the lowest in the region. Nevertheless, Romania's overall ICT sector is one of the most impressive in the emerging Europe region, standing shoulder to shoulder with Poland and Estonia. With more than 123,000 euros of ICT output per one employee in the sector, Romania ranks the highest in the region in this component.

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	3,378.5	4,008.5	4,796.7	5,591.8	6
of which computer services (millions, euros)	2,238.8	2,764.0	3,418.4	4,112.4	 4





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ICT EXPORTS



CLUJ-NAPOCA A regional hub of digital innovation



luj-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 of 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 organization 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

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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.



Altom





OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
6.872	2,894,775	46,367	6,748	196%	3,353
	Serbi	a's position in ir	nternational ran	kings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
54	47	46	64	14	42

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Serbia is a leader in the ICT industry in the Western Balkans. As with most countries in the South East European region, Serbia has a strong STEM education system producing many ITC graduates. However, the country has a significant brain drain problem with many of the best and brightest leaving the country early in their careers. Serbia has a friendly climate for foreign investors and remains a popular outsourcing destination.

Policy-wise, Serbia recognises the importance of the ICT sector. In 2017, the government unveiled a strategy for the 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. More recently, the Ministry of Education has put forth a proposal for a start-up ecosystem development strategy that is supposed to improve start-up financing mechanisms and business climate

In 2020. Serbia came close to its 1.5 billion euros ICT export goal with total ICT exports at 1.44 billion euros or 3.1 per cent of the country's total GDP. This value is a marked increase from 2016 when the exports totalled 740 million euros. It is also the highest ICT export in the Western Balkans. Overall, Serbia generates around 5.5 per cent of its GDP from the ICT sector. In recent years, Serbia has seen the development of its



gaming sector, with companies like Nordeus creating high-earning games like Top Eleven which has seen over 200 million downloads. In 2020, according to the Serbian Games Association. the sector brought in around 120 million euros in revenue. Blockchain technologies are another emerging sector in Serbia — the country is fifth in the world by number of blockchain developers according to Startup Genome.

On the start-up front, the Serbian ecosystem is still developing. While there has been a number of high valuations and funding rounds, the country is yet to produce a unicorn. This year, Nordeus, the country's most successful start-up to date, was sold for 378 million US dollars to the American gaming company Take Two Interactive. On the funding side, Orgnostic, an HR platform, has secured five million US dollars, while the job-seeking platform Joberty has secured 350,000. Despite this, Serbian start-ups still suffer from a lack of funding, due to the generally undeveloped domestic VC capacities. There are, however, several hubs and accelerators including the Impact Hub and Science and Technology Park Zvezdara.

EXPORTS

	2016	2017	2018	2019	2
Export of ICT services (millions, euros)	739.5	898.9	1,134.6	1,422.4	1,4
of which computer services (millions, euros)	589.8	 759.7	1,016.1	1,269.6	 1,3





QUANTOX TECHNOLOGIES: From one man show to multinational enterprise

Serbian outsourcing firm Quantox Technologies has big plans for 2022, from acquisitions to a start-up accelerator aiming to assist promising young firms on their path to market.

By Marek Grzegorczyk

Juk Popović, the founder of Quantox Technologies, makes no qualms about the fact that the firm, now a multinational enterprise with 13 offices across seven countries (Serbia, North Macedonia, Montenegro, Bosnia and Herzegovina, Ukraine, Romania, and Germany) started out small.

Verv small in fact

"Initially, when I founded the company in 2006, it was a one man show," he says, speaking to Emerging Europe from Quantox's head office in Belgrade.

Popović by then was already a seasoned entrepreneur: he began his career as a teenager, in affiliate marketing. "I got my first cheques at the age of 14." he says.

Quantox Technologies today employs around 450 people across its many offices, with the baulk of the team in his native Serbia. It offers customised web development and IT consulting services to firms of all sizes. from the US. Canada. Western Europe and - more recently -Israel.

"We had been planning to open an office in Tel Aviv before Covid-19 made travel to Israel difficult," he says. "It's still something that we want to do."

The site of Quantox's growth right now however is Germany, where Popović is developing a sales team and wants to add 20 developers this year, as it moves into new areas of operations, such as the implementation of different software, including Microsoft and AWS.

"Indeed, we have just partnered with Microsoft, and we are looking forward to doing much more of this kind of work, not just web development," he confirms.

Besides temporarily halting Quantox's Tel Aviv plans, Covid-19 affected the business in other ways.

"In the month after the pandemic arrived in Serbia, on March 15, 2020, business dropped sharply, by around 20 per cent," Popović says. "But after that, business doubled, it went through the roof."

Finding and keeping talent According to the Quantox founder, Serbia right now is a "hotspot" for outsourcing and product development: something that he admits can make finding talent difficult.



"We are competing for employees with some of the world's biggest players. Microsoft's largest research and development centre in Europe is here in Belgrade, with 500-600 people."

One of the ways that Quantox is trying to recruit and retain talent is with is Quantox Academy

"It's proven to be very successful," says Popović. "For some years now we have been taking on interns and developing them into future employees and co-workers.

"Last year, in September, we had had a big intake of 100 interns, and in December 67 of them completed their internships: we immediately hired them all.

Quantox also prides itself on being a good place to work. It had implemented a policy of remote working for two months of the year prior to Covid-19, which made the adjustment to full-time remote working much easier.

"It did not catch us by surprise," adds Popović. "We try to stay positive; we try to be close to our employees. We regularly visit the regional offices, the offices in other countries. We make sure that we stay connected."

'Demand is huge

As the Covid-19 boom in outsourcing has demonstrated, there is still enormous scope for the industry to grow. Popović

says that demand is huge. "Every day we are being asked for developers. Just last week we signed a deal for 120 developers through until the end of 2022. We could do no more sales at all this year and still grow by around 80 per cent." But sales are precisely what Quantox

is about to do, with Popović revealing that the Germany office will be the centre of the newly developed sales team.

"Until now most of our cilents have come through recommendations, personal connections, upselling. We have also been present at a lot of conferences and events. But with so much business out there we are now looking for better paying clients.

"Certainly, the problems with access to talent is something to think about, but I do not see it hampering our growth. It is a problem, but it is a great problem to have.'

Quantox will also be growing in 2022 through a series of acquisitions. Last year it purchased a Serbian mobile boutique that will allow it to boost its mobile development offering and is currently negotiating two more acquisitions for 2022. "This time firms doing much the same as we do, but with different clients," says Popović.

Then there is QLabs, a start-up accelerator, offering early-stage ideas business development assistance, legal, and go-to-market help.

"We are actively looking for good start-ups to sign up," says Popović. "At the beginning we will identify start-ups but as the project grows, we hope that startups will begin to come to us.'

Quantox has set a target of 10 startups a year for its QLabs programme, which Popović confirms is not limited to Serbia

"We are looking around the region and - why not - worldwide."



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SLOVAKIA

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
5.460	2,531,300	91,555	16,769	185%	-1,689
	Sloval	kia's position in i	nternational rar	nkings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)
61	37	32	39	20	63

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Slovakia, long-known as a manufacturing powerhouse, has been making strides in the ICT sector as well. Since splitting from Czechia in 1993. Slovakia has moved away from its industrial roots to become 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. A significant video game industry is also developing in the country.

When doing business in Slovakia, companies and investors must be aware of the country's high corporate tax, which at 21 per cent is one of the highest in the entire emerging Europe region. There is no special tax rate for ICT businesses. Wages (gross average) in the sector are higher than in the general economy by 64 per cent (2,192 euros compared to 1,333 euros), but on the whole they are still lower than in the western part of the EU.

Currently, ICT exports make up 1.64 per cent of the country's GDP at 1.5 billion euros. This is a marked increase since 2016 when exports were around 1.09 billion. In 2020, the sector employed 92,900 people or 3.7 per cent of all those employed in Slovakia, which put the country above the regional average. In recent years, video games have emerged as a particular strength of the ICT sector. Revenues have doubled over the last two years. and 2020 was a banner year for



the industry which recorded a total turnover of 72 million euros, much higher that the projections that stood at 55 million. 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.

When it comes to start-ups, the Slovakian ecosystem is still finding its feet, mostly due to stringent bureaucratic obstacles not found elsewhere in the EU, but still there is cause for optimism. Today, there are four ICT-oriented technology parks in Slovakia, including the STU Science Park at the University of Bratislava. These parks offer guidance, mentoring, networking events and talks to start-ups. One of the most exciting Slovakian start-ups is Aeromobil, which is attempting to develop a 'roadable aircraft' or flying car.

In education, seven faculties at six universities give classes in ICT subjects as well as support platforms for innovative business

ideas. Last year, there were 6,775 ICT students and 1,547 graduates. Per 100,000 citizens Slovakia has 28 ICT graduates which places it at the bottom of the pack in emerging Europe. Still. with six faculties and ICT-technological parks there is clearly enough potential to educate a well-qualified cadre of ICT experts.

In the IT Competitiveness Index Slovakia is seventh in the emerging Europe region. While the country has all the right building blocks to succeed in ICT, it will have to address the issue of ICT education. Currently, it ranks low in terms of the number and percentage of students and graduates, as well as in terms of bureaucratic roadblocks for entrepreneurship. In the ICT Regulatory Index, Slovakia is ranked 15th in the region. While education numbers are among the lowest, the country does actually have one of the highest percentages of ICT specialists in total employment – 3.7 per cent. Overall, Slovakia is on its way to becoming a serious contender in the ICT sector.

EXPORTS

		2016	2017	2018	2019	
Export of IC (millions, eur	T services	1,087.1	l 1,369.3	1,499.4	1,526.8	1,
of which cor services (mi	nputer lions, euros)	744.9	 957.6	1,084.3	1,089.1	 1,





certain equipment and intangible assets.

In 2020, Slovenia exported ICT services valued at 659 million euros which represented 1.42 per cent of its GDP. There was growth of 19.3 per cent in the last five years. The sector employed 38,750 people in 2020 representing four per cent of the total employment — a significant percentage given the country's small population of just over two million. This figure is the second highest in the region.

The Ljubljana Technology Park, established all the way back in 1996, has long served as the central hub of the country's impressive start-up ecosystem. 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. More start-ups to keep an eye on include the cryptoinvesting platform ICONOMI that has attracted five million euros in

funding and the Y-Combinatorbacked PredictLeads which helps VC investors find high-growth companies.

Education-wise, there were 4,632 IT students and 643 graduates in 2020, and as many as 220 IT students per 100,000 inhabitants, one of the best proportions in the region. University of Ljubljana offers ICT studies in its Faculty of Computer and Information Science.

In the IT Competitiveness Index, Slovenia ranks fifth. The country has the highest position in terms of human development (22nd globally in the Human Development Index) and social progress (26th globally in the Social Progress Index), as well as the highest level of English competence in the region. An emerging start-up scene, worldclass education and a cosmopolitan and adaptable workforce are the main strengths of Slovenia when it comes to the ICT sector. Slovenia has shown one of the highest annual increases in the number of ICT students in the last five years. It also has the smallest payment gap between the average ICT salary and average salary in the economy - only 32 per cent in 2020.

EXPORTS

	2016	2017	2018	2019	2
Export of ICT services (millions, euros)	551.8	543.6	539.5	628.7	6
of which computer services (millions, euros)	160.7	 172.1	205.7	253.4	2

SLOVENIA

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)
2 2 2 2 2 2 2			ê.		
2.109	978,250	46,297	21,952	135%	463
	Slover	nia's position in	international rar	nkings	
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 88) (2018)	Online Service Index (of 193)
48	27	14	22	9	24

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22

4.0% 3.9% 4.0% 3.4% 3.3% 3.5% 3.4% Percentage employed in ICT 33,500 33,000 33,500 00 Number 30,250 of people employed in ICT 2016 2017 2018 2019 2020 2021 2022 forecast



Slovenia has been slowly but surely taking steps to emulate the success of other small countries that have a well-developed ICT sphere. 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.

Recognising the importance of the ICT sector, the Slovenian government has launched an 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 amend the law on foreign workers to allow ICT companies to employ non-EU citizens. Slovenia also started preparing a National Programme for the Promotion of Development and Use of Artificial Intelligence. Slovenia is one of the countries with a high corporate tax rate at 19 per cent. However, there are incentives that the ICT sector can take advantage of: a deduction of 100 per cent of the amount invested in domestic R&D activities and the purchase of R&D services, as well as a deduction of 40 per cent of the actual amount invested in





TAJIKISTAN

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)	
9.506	2,226,381	7,177	755	464%	93	
Tajikistan's position in international rankings						
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)	
134	123	-	125	103	155	

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



*estimate based on official data

Tajikistan is a landlocked mountainous country with a young, largely rural population and a long-standing history of Russian influence. It is yet another country in Central Asia which could benefit from developing its ICT industry, and the hope is that ICT could be a good way to offset some of the country's economic problems such as a lack of natural resources.

Tajikistan has a 70 per cent fluency rate in Russian as a foundation to develop the ICT industry. English, however, is much less widely spoken, with Taiikistan ranking the lowest in the Central Asia region and 103th out of 112 countries globally in the 2021 edition of the EF English Proficiency Index.

Tajikistan remains largely underdeveloped. The internet in the country emerged as Tajikistan was ending a civil war which followed the demise of the Soviet rule in the early 1990s, resulting in fragmentation of power which meant that internet services developed largely without state interference. Today Tajikistan offers relatively expensive internet, of which only 26 per cent of the population had access to as of early 2020. Few companies enjoy broadband access and fewer than one per cent offer digital services. This limited use of the internet has greatly hindered the transformation of the country's industrial sector.

However, there are a few success stories out there, like the fintech start-up Alif Sarmova. founded by Taiiks studving in the US, which



now employs some 250 people and has revolutionised Tajikistan's banking system, or Somon.tj, a company changing the way people engage in retail business. These companies set a good precedent for the development of the industry, although the government could play a more active role in supporting it.

Rather than being groomed by governmental support, successful Taiik start-ups tend to be grassroots initiatives established by young people and for young people. The budding start-up ecosystem is supported by a number of accelerators and incubators such Accelerate Prosperity, which was founded in 2016 in the capital city of Dushanbe and has since incubated more than 150 start-ups.

Among the poorer countries in the Central Asia region, the Tajik economy depends to some extent on remittances from labour migrants. The population of Tajikistan is 9.5 million people but according to estimates, in 2021 some 1.6 million Tajiks worked in Russia alone, their

incomes making up to 28 per cent of Tajikistan's GDP.

While the average gross salary in the economy stood at 124 euros in 2020, the average gross salary in the ICT sector was 90 per cent more – 235 euros. Our estimates show that there were 12,220 people employed in ICT in Tajikistan in 2020, which constituted about 0.5 per cent of the total number of people employed in the economy. As for the country's higher education, there were 8,218 ICT students in 2020, while the number of ICT graduates more than doubled between 2016 and 2020 and stood at 3.284.

There has been a downward turn in terms of Tajikistan's ICT exports in recent years. ICT exports as a percentage of GDP dwindled from 0.15 per cent in 2016 to 0.07 per cent in 2020, while the ICT value added as percentage of GDP decreased from 3.25 to 1.16 per cent in the same period. In a similar fashion, the country's export of ICT services went down from 9.2 million euros in 2016 to just five million euros in 2020.

EXPORTS**

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	9.2	4.7	5.7	6.1	
of which computer services (millions, euros)	0.0	0.0	0.4	0.2	1

** SOURCE: ITC, UNCTAD, WTO based on IMF statistics for 2016-2019 and estimated for 2020





UKRAINE

OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)	
41.419	15,915,300	136,213	3,289	160%	-760	
Ukraine's position in international rankings						
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)	
127	60	43	74	40	72	

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



Ukraine is emerging Europe's sleeping ICT giant. A large and highly educated population and a relatively low cost of living make it an incredibly attractive outsourcing destination. As a matter of fact. outsourcing remains the primary segment of Ukraine's ICT sector, with around 60 per cent of all Ukrainian ICT specialists working for outsourcing companies. International heavyweights like Microsoft, Google and Ubisoft all have offices in Kyiv.

On the regulation front, the Ukrainian government has pursued policies to grow the ICT sector. 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. Ukraine's corporate tax rate is 18 per cent.

In 2020, Ukraine exported 4.54 billion US dollars worth of ICT services, a significant jump from 2016's 2.09 billion US dollars. 283,700 people were employed in the ICT sector in 2020, which is one of the largest ICT workforce pools in emerging Europe despite only making up 1.8 per cent of the country's overall employment. 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 cheque 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 the second place. The volume of TOP-10 transactions has almost doubled to 456 million US dollars.

Ukraine also has a pretty strong start-up ecosystem that has birthed five unicorns already: GitLab, Grammarly, Genesis, People.ai and Firefly Aerospace. In recent years, private companies have taken ambitious steps to improve Ukraine's ICT infrastructure.

Last year, Ukraine's government launched Diia City, a special economic zone providing a new legal and tax framework for IT companies, which the country and key partners believe will boost its status as a tech powerhouse.

Ukraine also leads the region in education. In 2020, there were 109,439 IT students in the country and 26,246 graduates. At 63 per

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	2,086.9	2,443.2	2,940.8	3,868.8	4
of which computer services (millions, euros)	1,784.3	 2,199.7 	2,713.1	3,727.6	 4,

100,000 people, Ukraine also has the highest number of IT graduates per 100,000 in the region.

In the IT Competitiveness Index, Ukraine is ranked 14th. The country has all the makings of a future strong player in Europe's ICT industry: a lot of qualified talent and a start-up ecosystem that is growing all the time and producing unicorns. Although the country doesn't rank too well in the Corruption Perception Index (117th globally), EF EPI (40th globally), it still has one of the most competitive salaries in the region, the cheapest internet connection, the highest annual increase in the output of the ICT sector and the highest rank in the International Mathematical Olympiad.

Outsourcing remains the country's true strength - 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 that in any other emerging Europe country. Ukraine is ranked the second in the Economic

section (ranked 19th).





UKRAINE: Speed of Growth

By Valery Krasovsky



he Ukrainian tech industrv 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 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 our 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 technologyconsulting group and one of the world's TOP100 outsourcing companies. Sigma Software is among the TOP B2B companies according to Clutch.

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.



OVERVIEW

Population (million)	Employed population	GDP in current prices (millions, euros)	GDP per capita (euros)	GDP change 2000-2020 (%)	FDI Inflow (millions, euros)	
2 2 2			<u> 2</u>			
34.559	13,236,353	50,525	1,462	303%	1,511	
Uzbekistan's position in international rankings						
Index of Economic Freedom (of 178)	Social Progress Index (of 168)	PISA Mathematics (of 78)	Human Development Index (of 189)	EF English Proficiency Index (of 112)	Online Service Index (of 193)	
108	95	-	106	88	46	

ICT GROSS SALARY IN 2016-22



ICT EMPLOYMENT IN 2016-22



*estimate based on official data

Uzbekistan has by far the largest population in Central Asia at 34 million people, of which over 50 per cent have internet access. In 2020, Uzbekistan published its Digital Strategy 2030, a plan outlining the goals the country aims to achieve to accelerate its digital readiness. Improved digital infrastructure and the adoption of digital solutions across Uzbekistan's various industries will support the country in its efforts to diversify its economy away from commodity exports.

Despite the government's commitment, attracting private investment will likely be vital to a successful implementation of the digital strategy. However, risks remain for private investors, especially in relation to corruption and cybersecurity. Uzbekistan has been moving up in the Global Cybersecurity Index in recent years but was still ranked relatively low at 70th in 2020.

Throughout the current decade, Uzbekistan is seeking to power its digital transformation and achieve the goals set out in its digital strategy, which include increasing internet access for the population (50 per cent of which is rural), 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.

The country's start-up ecosystem is in its early stages, but with help from government initiatives a



start-up scene is slowly beginning to emerge. 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 and provides tax benefits for resident companies, incubation and acceleration programmes for local start-ups, investment into start-ups through venture funds as well as hackathons and other events.

As is the case with 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. In the 2021 edition of the EF English Proficiency Index, Uzbekistan scored best in the Central Asian region but was 88th overall out of 112 ranked countries.

According to our estimates, there were around 62,300 people employed in the Uzbek ICT sector in 2020, which accounted for just 0.5 per cent of all people employed in the economy. The figure has remained relatively stable since 2016. The average gross salary for ICT

employees in Uzbekistan amounted to 372 euros in 2020. This figure was much higher than the average gross salary, which stood at 226 euros. However, due to the instability of currency rates, the average salary in ICT has been changing significantly year to year (483 euros in 2014, 622 euros in 2016 and 320 euros in 2018). In terms of the country's education, our estimates show that there has been a steady increase of ICT students with the number nearly doubling between 2016 and 2020. There were about 11,300 ICT students in Uzbekistan in 2020 as well as about 3,000 graduates. The authorities aim to persuade many more young people to study ICT with the help of initiatives like the ambitiously-named "One Million Uzbek Coders", a free online programming course.

The export of ICT services in 2020 was worth 145.8 million euros, of which only 9.6 million euros was related to computer services. ICT value added accounted for 1.52 per cent of the country's GDP in that same year, decreasing from 1.87 per cent in 2017.

EXPORTS

	2016	2017	2018	2019	
Export of ICT services (millions, euros)	133.3	133.4	132.6	147.7	.
of which computer services (millions, euros)	4.1	 5.0	4.3	6.2	1



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ADDITIONAL RESOURCES



TECHNOLOGY ECOSYSTEM

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 Western Balkans Yunus Tirana Inc. Growpreneur

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

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) CIVITTA

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 27 countries, of which:

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. four countries of the Central Asia region – Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan.

Turkmenistan is not included in the research due to a lack of reliable information.

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 or average gross wage or average gross earning or average nominal wages in NACE Rev. 2 section J 'Information and communication'. Terms 'average salary in ICT', 'average ICT salary', 'average wage in ICT' are used interchangeably and characterise the abovementioned concept.

Labour data is collected according to the Labour Force Survey data (according to the methodology of the International Labour Organisation). This approach refers to the data on 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 a weighted average of 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.

Number of people working in ICT - number of

persons employed in NACE Rev.2 section J 'Information and communication'. 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 is converted to euros using the exchange rate of the national currency of respective country in respective year as reported by UNCTAD. Data in US dollars is converted to euros using the exchange rate of USD to euros in the respective year as reported by UNCTAD.

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 counties and the International Trade Center database are the sources of the statistics. Data from the ITC database are acquired in USD and converted to euros using the exchange rate of the national currency of respective country in respective year as reported by UNCTAD. 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 population refers to the mid-year present population.

Nominal GDP refers to the gross domestic product in current prices. Calculation based on the gross domestic product in local currency divided by the exchange rate of local currency unit (or USD in case data are reported in USD) to euros in the respective year as reported by UNCTAD.

GDP per capita is calculated by dividing the nominal GDP by the population of the country.

GDP change 2000-2020 is calculated as the difference between the gross domestic product in international dollars (converted using purchase power parity rates) in 2000 and 2020 in per cents. 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 inward FDI figure is based on the data from the Central Bank of the Republic of Kosovo. Data in US dollar are converted to EUR using

Eurostat database.

(ISCED) 2011.

- the exchange rate of USD to euros in respective year as reported by UNCTAD.
- 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 the respective year reflects the numbers as of the start of the 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 the 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
- 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 on 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 on the 7th and 8th level of education according to the International Standard Classification of Education

NOTES

Missing figures are modelled based on the data for available years using linear approximation or exponential smoothing.

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, as well as modelling using exponential smoothing.

IT COMPETITIVENESS INDEX METHODOLOGY

The IT Competitiveness Index consists of 47 parameters divided between four sections, each of them consisting of three subsections:

- Talent 40 per cent, which is composed of three subsections with a total of 18 parameters: 1.
- 1.1. Education 20 per cent. Composed of 10 parameters:

1.1.1. Number of ICT students. Based on the data for 2020 (when official data is available) or estimates for 2020 (when official data is unavailable). Weight: 1 per cent.

1.1.2. Average annual increase or decrease in the number of ICT students. Based on the official data for 2016-2020 or mix of official data and estimates for the same period. Weight: 2 per cent.

1.1.3. Number of ICT graduates. Based on the data for 2020 (when official data are available) or estimate for 2020 (when official data is unavailable). Weight: 1 per cent.

1.1.4. Average annual increase or decrease in the number of ICT students. Based on the official data for 2016-2020 or mix of official data and estimates for the same period. Weight: 2 per cent.

1.1.5. Number of ICT students per 100,000 of population. Based on the data for 2020 (when official data is available) or estimate for 2020 (when official data is unavailable). Weight: 1.5 per cent.

1.1.6. Average annual increase or decrease in the number of ICT students per 100,000 of population. Based on the official data for 2016-2020 or mix of official data and estimates for the same period. Weight: 2.5 per cent.

1.1.7. Number of ICT graduates per 100,000 of population. Based on the data for 2020 (when official data are available) or estimate for 2020 (when official data are unavailable). Weight: 1.5 per cent.

1.1.8. Average annual increase or decrease in the number of ICT graduates per 100,000 of population. Based on the official data for 2016-2020 or mix of official data and estimates for the same period. Weight: 2.5 per cent. 1.1.9. International Mathematical Olympiad Rank. Based on the data for 2021. Weight: 3 per cent.

1.1.10. PISA Mathematics rank. Based on the data for 2018. Weight: 3 per cent.

1.2. Labour force – 8 per cent. Composed of 5 parameters:

1.2.1. Number of people working in ICT. Based on the data for 2020. Weight: 1 per cent.

1.2.2. Average annual increase or decrease in the number of people working in ICT. Based on the data for 2016-2020. Weight: 1.5 per cent.

1.2.3. Number of people working in ICT as percentage of total employed in the economy. Based on the data for 2020. Weight: 2 per cent.

1.2.4. Average annual increase or decrease in the number of people working in ICT as percentage of total employed in the economy. Based on the data for 2016-2020. Weight: 2.5 per cent.

1.2.5. Number of developers per 100,000 of population. Based on Stackoverflow data for 2019. Weight: 1 per cent. 1.3. Talent competitiveness – 12 per cent. Composed of 3 parameters:

1.3.1. Number of TopCoder participants per I win in TopCoder competition. Data was exctracted on August 27, 2021. Weight: 3 per cent.

1.3.2. EF English Proficiency Index rank. EF EPI ranking for 2021 was used. Number of points assigned to Slovenia is based on the result in 2018 ranking. Number of points assigned to Bosnia and Herzegovina is based on the result in 2016 ranking. Weight: 4 per cent.

1.3.3. Google Code Jam Qualification Round result. Calculated as an average number of points acquired by all the participants of the qualification round of the Google Code Jam competition in 2021. Weight: 5 per cent. 2. IT Infrastructure - 20 per cent, which is composed of three subsections with a total of eight parameters:

2.1. Connectivity – 10 per cent. Composed of four parameters:

2.1.1. Speed of broadband Internet. Based on the data of Ookla Speedtest data on download speed for December 1, 2021. Weight: 4 per cent.

2.1.2. Cost of data. Based on the data on the average cost of monthly subscription for broadband internet for 2020 by Cable.co.uk. Weight: 4 per cent.

2.1.3. International bandwidth. Based on the data for 2020 or latest available year as reported by the International Telecommunication Union. Weight: 1 per cent.

2.1.4. International bandwidth per user. Based on the data for 2020 or latest available year as reported by the International Telecommunication Union. Weight: 1 per cent.

2.2. Digital transformation – 7 per cent. Composed of 3 parameters:

2.2.1. Online Service Index value. OSI is a part of the UN E-Government Development Index. Based on the data for 2020. Weight: 2.5 per cent.

2.2.2. E-Participation Index value. Based on the E-Participation Index 2020 by the UN. Weight: 2.5 per cent.

2.2.3. Percentage of Individuals using the Internet. Based on the data for 2020 as reported by ITC and national statistical authorities. Weight: 2 per cent.

2.3. Non-personnel resources – 3 per cent. Composed of 1 parameter:

2.3.1. Secure Internet servers per 1 million of population. Based on the data for 2020 as reported by the World Bank and Netcraft. Weight: 3 per cent.

3. Economic impact - 20 per cent, which is composed of three subsections with a total of 11 parameters:

Economic performance – 9 per cent. Composed of six parameters: 3.1.

3.1.1. Export of computer services as percentage of GDP. Calculated as the volume of export of computer services (EBOPS 2010 service category 9.2) as reported by national banks, national statistics offices or ITC divided by GDP as reported by the World Bank. Based on the data for 2020. Weight: 1.5 per cent.

3.1.2. Average annual increase or decrease of the volume of export of computer services as percentage of GDP. Based on the data for 2016-2020. Weight: 2.5 per cent.

3.1.3. Output of ICT per one employed person in the ICT sector. Based on the official, estimated or forecasted data for 2020. Output of ICT per one employed person is defined as quotient of the value added and intermediate consumption of the information and communication sector (NACE Rev. 2 section J 'Information and communication') divided by the number of employed in the sector as reported by national statistics office or ILO. Weight: 1 per cent.

3.1.4. Average annual increase or decrease of the output of ICT sector per one employed person in the ICT sector. Based on the data for 2016-2020. Weight: 1.5 per cent.

3.1.5. Value added of ICT as percentage of GDP. Parameter is calculated by dividing the value added of ICT by GDP. Based on the data for 2020. Weight: 1 per cent.

3.1.6. Average annual increase or decrease of the value added of ICT sector as percentage of GDP. Based on the data for 2016-2020. Weight: 1.5 per cent.

3.2. Cost competitiveness - 7 per cent. Composed of 4 parameters:

3.2.1. Average salary in ICT sector. Based on the data for 2020. Weight: 1.5 per cent.

3.2.2. Average annual increase or decrease of the average salary in ICT sector. Based on the data for 2016-2020. Weight: 2.5 per cent.

3.2.3. Average salary in ICT sector as percentage of the average salary in the economy. Calculated as a quotient after division of the average salary in ICT sector by the average salary in the economy for the respective year. Based on the data for 2020. Weight: 1 per cent.

3.2.4. Average annual increase or decrease of the average salary in ICT sector as percentage of the average salary in the economy. Based on the data for 2016-2020. Weight: 2 per cent.

3.3. COVID resistance - 4 per cent. Composed of 1 parameter:

3.3.1. COVID resistance. Calculation of the Covid resistance parameter is based on the mean value describing the quotient derived by dividing the factual data on the volume of export of computer services (parameter 1), average gross salary in the ICT sector (parameter 2), value added in the ICT sector (parameter 3), number of persons employed in the ICT sector (parameter 4), and gross domestic product (parameter 5) for 2020 by the linear forecast for the same parameters for 2020 based on 2015-2019 data:

COVID Resistance=
$$\left(\sum_{n=1}^{5} \frac{Fact_{n}}{Forecast_{n}}\right) / 5 * 100\%$$

where:

Fact factual value for parameter n;

Forecast, linear forecast for parameter n.

Weight: 4 per cent.

- 4. Business environment - 20 per cent, which is composed of three subsections with a total of 10 parameters:
- 4.1. Intellectual property and cybersecurity 6 per cent. Composed of two parameters:
- 4.1.1. International Property Rights Index value. Based on the index value for 2021. Weight: 3 per cent.
- 4.1.2. Global Cybersecurity Index value. Based on the index value for 2020. Weight: 3 per cent.
- 4.2. Support for industry development 9 per cent. Composed of 3 parameters:

4.2.1. The ICT Regulatory Tracker Index value. Based on the index value for 2018. Weight: 3 per cent.

4.2.2. The Regulatory Quality Index value. Based on the index value for 2020. Weight: 3 per cent. 4.2.3. The Regulatory Quality Index value change between 2015 and 2020. Calculated as a difference between the

value in 2020 and 2015. Weight: 3 per cent.

4.3. Economic competitiveness – 5 per cent. Composed of 5 parameters: 4.3.1. Economic Freedom Index value. Based on the index value for 2021. Weight: 1 per cent. 4.3.2. Youth Progress Index value. Based on the index value for 2021. Weight: 1 per cent. 4.3.3. Human Development Index value. Based on the index value for 2020. Weight: 1 per cent. 4.3.4. Corruption Perception Index rank. Based on the ranking for 2020. Weight: 1 per cent. 4.3.5. Social Progress Index value. Based on the index value for 2021. Weight: 1 per cent. In case the figure is unavailable due to 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 worst figure in the region, 100.00 points are assigned to the country which has the best figure in the region.

Calculations for the parameters 1.1.1.-1.1.8.; subcategory 1.2.; parameters 1.3.3., 2.1.1., 2.1.3., 2.1.4.; subcategories 2.2., 2.3., 3.1., 3.3., 4.1., 4.2.; parameters 4.3.1.-4.3.3, 4.3.5 are done using the following formula:

Points= $\left(10 + \frac{Value-Min value}{Max value - Min value} * 90\right)$ *Weight

Max value - the highest figure in the region:

Min value - the lowest figure in the region; Weight - weight of the parameter.

Calculations for the parameters 1.3.1, 2.1.2.; subcategory 3.2. are done using the following formula:

Points= (100 - Value-Min value Max value -Min value * 90) *Weight

where:

where:

Max value - the highest figure in the region; *Min value –* the lowest figure in the region;

Weight - weight of the parameter.

Parameters 1.1.9., 1.1.10., 1.3.2., 4.3.4. are decribed by the position in ranking, 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,= (100 - Value-Min value, * 30) *Weight

where:

Max value, - lowest rank in the first group of countries; Min value, - 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 value, - lowest rank in the second group of countries; Min value, - 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:

Points₃= $(70 - \frac{\text{Value-Min value}_3}{\text{Max value}_7 - \text{Min value}_7} * 30)$ *Weight

where:

Max value,- lowest rank in the third group of countries; Min value,- highest rank in the third group of countries; Weight - weight of the parameter.

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Baltic Times Bit Alliance Blog Chainalysis **Bloomberg News** Caucasus Business Week **CEE Legal Matters CIS** Legislation CNBC Croatia Week Czech Invest: Investment and Business Development Agency Datareportal 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 Game Reactor Georgia Today Georgian National Investment Agency German Corporation for International Cooperation (GIZ) German Outsourcing Association **Global Sourcing Association** GOV Go Vilnius Heritage Foundation Hungarian Investment Promotion Agency IBM India Times 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 in Estonia 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 Estonia Startup Blink Startup Poland Statista TechCrunch

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ABBREVIATIONS 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 Invest
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

vestment Position Manual

- 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







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