

Central & Eastern Europe

Emerging Industries

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Hungry for a piece of the action

The region's start-ups have exciting ideas but a lack of finance and support can hold them back, writes *Henry Foy*

With a deep scar across his eye and a sword slung on his back, Geralt of Rivia, a monster-slaying, witch-hunting computer game hero who loomed over New York's Times Square from a colossal advertising screen last month, is the new global face of central and eastern Europe's emerging industrial future.

The Witcher 3: Wild Hunt is the latest in a series that sees Geralt rampage across a mythical *Game of Thrones*-style world zapping evil spirits. It has put its Polish developer CD Projekt at the gaming world's top table, and thrown a spotlight on the region's innovative new technology scene.

"This is the big breakthrough for the company and we all feel it," says Michał Nowakowski, senior vice-president of business development at CD Projekt. "If this game is the success we hope, that puts us right up there in the global big boys' league, and that's where we want to play."

The company had a market capitalisation of about 700m złoty in 2013. It was worth 2.25bn złoty (\$600m) last week after shipping more than 1m pre-orders



Exceptional: Polish developer CD Projekt is riding high on the success of *The Witcher* – but many entrepreneurs struggle

of the game, and selling hundreds of thousands more to fans who queued overnight at shops around the world.

Yet for all the fanfare, Warsaw-based CD Projekt's global success remains an exception rather than the rule, as central

and eastern Europe strives to become an innovation hotspot.

Since emerging from communist rule a quarter of a century ago, with many states joining the EU 15 years later, the region's economies have swelled,

thanks mainly to low-cost manufacturing, exports and business reforms that increased productivity.

Today, countries such as Poland, Hungary and others are trying to shift their economies towards innovative and

creative industries in order to bridge the gap with western European states, and avoid the "middle-income trap", where rising prosperity erodes cost competitiveness, causing growth to plateau.

There have been successes. Skype, the video-calling program, was developed in Estonia. The Czech Republic's AVG and Avast protect hundreds of millions of computers from viruses. Two Slovaks have developed the world's first commercialisable flying car.

"There is a strong entrepreneurial streak here," said Andrzej Sykulski, managing partner and co-founder at Trigon, one of the region's largest boutique investment banks. He managed the 2014 public offering of LiveChat, a Polish-built business-to-business and business-to-consumer communication platform that has managed to take its product to global markets.

On paper, the region appears to have the attributes necessary for other companies to follow that path. Growing economies, rising private spending and a steady flow of tens of billions of EU funding have resulted in strong market dynamics to support new ideas and concepts. A historical focus on engineering, science and technology education means there is no shortage of smart, technically minded graduates with the skills to turn ideas into reality.

Warsaw had nearly 700,000 employed science and technology graduates in 2012, according to Eurostat, with more than 350,000 in Budapest and almost 200,000 in Prague. In 2012, Lithuania

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Central & Eastern Europe Emerging Industries

Lone rangers ride to the rescue of entrepreneurs

Venture capital Some wealthy investors are backing young talent when other funding is scarce, writes *Henry Foy*

Adam Sawicki is between jobs, but is not too worried about his pension; he has his investments in start-ups.

A successful executive who has worked across business and finance, Mr Sawicki has stakes in a number of Polish start-ups, part of a trend of informal investors backing the region's creative young talent. He says he has invested about €500,000 in the past three years.

"It started because we saw a lack of a structured way to fund these ideas," says Mr Sawicki, who has backed at least a dozen start-ups and is currently invested in five companies through a

business incubator and three via direct investments. "It's fun to see people growing. You don't always do it for financial reasons. If the companies are successful, then you benefit. But it's nice to give back, as well."

Across central and eastern Europe, an absence of a mature and well-spread venture capital industry, low research and development spends and often bureaucratic or inefficient government financing initiatives mean start-ups have struggled to find the initial capital to get off the ground.

But into this void have stepped wealthy individuals and private investors, who are backing their country's entrepreneurs and innovators, and helping bridge the gap between a bright idea and a viable business.

Mr Sawicki says: "There is a good supply of people who want to put money into things and help. It's not dumb money — we are also giving advice and access to our international networks."

Central and eastern Europe's growing

markets have attracted investors in medium and large businesses. But the start-up scene lacks the financial products found in the US or western Europe for early-stage investments in developing businesses.

Pawel Lakomy, director of Syntaxis Capital, a mezzanine fund focused on central and eastern Europe, says: "The early funding is coming from high-net-worth individuals and those that have sold out of businesses. They want to deploy capital, but they also want to assist with development, and they naturally have a different risk profile from traditional investors."

Mr Lakomy's fund typically provides financing to mature or well-developed companies planning a big investment. But long before that stage, start-ups can often struggle to find that first €50,000 to get going.

The region lags well behind the EU average in terms of R&D spending — typically a useful source of funds for entrepreneurs, either directly or from

the cash that trickles down through innovation supply chains.

While EU initiatives such as Horizon 2020, which provides grants to start-ups across the continent, have helped many initiatives in central and eastern Europe, a lack of an innovation culture across the region means that local government support is limited.

Daniel Boniecki, technology practice leader for central Europe at McKinsey, the management consultancy, says the region's public sector needs to be a much more effective investor and supporter of start-ups in order for innovation really to take off.

"We are lacking efficient or effective channelling of finance to commercialisable ideas," he says. "We need to be more focused and specific about what research and development money is spent on."

In Poland, spending on R&D in 2013 was €90 per capita, compared with the EU average of more than €520.

Private investors such as Mr Sawicki

and others — who typically invest in small groups that pool their capital and spread it across multiple companies — are offering an alternative. But many start-ups looking for substantial capital still turn to the world's biggest entrepreneurial hubs.

"There are interesting ideas here, developed to a certain stage," says

Mind the gap:
Maciej Zak says
good ideas are
often not matched
by development
funding in Poland



Maciej Zak, chief executive and co-founder of Dirlango, a start-up incubator.

"But," he adds, "then there is a need to go across the ocean for a funding round, maybe with a financial stopover in Berlin or London. International funding can add a zero to your valuation."

That may be changing, as financiers

consider filling in the venture capital gap. Andrzej Sykulski, founder and managing partner of Trigon, the largest boutique investment bank in central and eastern Europe, is interested.

"We are thinking about VC. The space is underdeveloped here," he says. "There are a lot of opportunities ... If we were looking at our own VC, we could be thinking of a couple of million zloty [€500,000] per investment."

According to research by Deloitte, a professional services firm, interest in the start-ups is gradually increasing within the well-established private equity industry in central and eastern Europe.

Mark Jung, private equity leader at Deloitte Poland, says: "A lot of funds are becoming more creative ... looking to build a market leader instead of buying one."

"There is a trend that smaller companies at the development stage are attracting investment ... There is a little more interest in the space."

Estonia sees a bright future for its power industry

Energy

New plants will reduce CO₂ emissions from kerogen shale, and there are plans to export the technology, writes *David Crouch*

It is like a vast geological sponge soaked in oil. But squeezing the energy out of kerogen shale, the poor relation in the shale oil boom, is dirty and expensive.

Now companies in Estonia, which for decades has relied on kerogen shale for the bulk of its energy needs, are seeking to persuade the world they have the keys to unlocking this energy source in new, clean and efficient ways.

Kerogen shale is more commonly, and confusingly, known as oil shale. Sulfur-fused with kerogen — a precursor of oil — when mined, crushed and heated to high temperatures the rock releases oil and gas. Shale oil, in contrast, is oil locked inside rock that can be released by drilling down and injecting high-pressure water, sand and chemicals. The oil obtained from kerogen shale is also known as shale oil.

Estonia is unique in its reliance on kerogen shale for energy. It sits on large deposits and is almost independent in energy — an important consideration for a young nation bordering oil-rich Russia. Estonia uses 85 per cent of the shale it mines to generate electricity, with most of the rest producing oil.

Hando Sutter, chief executive of Eesti Energia, Estonia's largest power company, says: "We don't have other energy resources, no hydro, oil or gas; so ever since our people found there is a rock you can burn, they have been innovative — we have been generating power from oil shale for almost 100 years."

Now Eesti Energia — Enefit outside Estonia — is taking the first steps towards exporting the technology it has refined for decades. It expects to get the go-ahead this year from the government of Jordan to build a 540MW power station based on rock containing marine micro-organisms deposited 65m years ago. Jordan imports most of its energy, making its oil shale deposits a potentially valuable resource.

"This is the first major export — the investment is very big. I hope it is the



first of many," says Alar Konist, a senior researcher at Tallinn University of Technology.

There are oil shale deposits in more than 30 countries, with resources in place of about 5,000bn barrels of oil — more than estimated known reserves of oil recoverable by conventional methods.

Mining has taken place in the US, China, Russia, Jordan, Brazil, Morocco and Estonia — in descending order of resource availability, according to the International Energy Agency — though Estonia has seen the most activity.

In 2011 Eesti Energia bought a large oil shale deposit in the US state of Utah, which the company believes contains 2.6bn barrels of recoverable oil. The US has 80 per cent of the world's oil shale. The IEA estimates that an oil price of at least \$60 per barrel is required to make commercial exploitation of kerogen shale for oil production profitable.

But there are strong environmental objections to kerogen shale, which produces high carbon dioxide emissions when used to generate power. Estonia's per capita emissions are higher than Russia's and twice those of Italy or Ukraine, though still lower than the US.

Cutting edge:
Eesti Energia's
oil shale
processing plant
in Narva

Bloomberg

'We don't have other energy resources. We have generated power from oil shale for 100 years'

Keith Burnard, head of the Energy Supply Technology Unit at the IEA says: "Experience has shown that exploitation of oil shale, whether for oil production, power generation or industrial use, is energy-intensive and CO₂-intensive.

"In Estonia, one might argue its use is positive for energy security and economic development — but it is certainly not positive for the environment."

Estonia's total CO₂ emissions have remained roughly stable over the past 20 years, although oil shale output has climbed, as the process of extracting energy has become more efficient. Now, Estonia says that further increases in efficiency will reduce energy-related CO₂ emissions to half the 2007 level by 2020.

Eesti Energia has been piloting a new generation of shale oil power plants, the first of which is planned to be commissioned at design capacity this year, with more than double efficiency compared with older plants. "Through cogeneration of oil, gas and power all at once, we can halve our CO₂ emissions," says Mr Sutter.

French multinational Alstom is building a combined oil shale and biomass power plant for Eesti Energia in Narva,

near the Russian border, designed to meet future stringent EU emissions targets. The €640m plant is the largest energy investment since Estonian independence. Its use of biofuels in place of some of the oil shale can lower the plant's CO₂ emissions to levels similar to those of modern natural gas power stations, the company says.

Large amounts of ash remain after the oil separation process, but instead of being dumped it can be used in the cement industry, according to Dr Konist. "It is one of the key things when we talk about developing this technology," he says, arguing that calculations of CO₂ emissions from oil shale do not take this into account.

Estonian company VKG is also developing a sideline in extracting phenols and other commercial chemicals from the shale oil or waste water used in older technologies, Dr Konist adds.

In collaboration with Finland's Outotec, Eesti Energia is testing different kinds of oil shale around the world, to adjust its technology to local conditions.

"We are preparing for export," Mr Sutter says. "We are introducing oil shale to the world."

'I believe we can turn Romania into a tech hub'

Technology

Emi Gal, the country's answer to Mark Zuckerberg says it must overcome cultural reluctance to take risks, writes *Andrew Byrne*

Emi Gal's admirers describe him as Romania's Mark Zuckerberg, but the 30-year-old serial technology entrepreneur demurs when asked if he welcomes the description. "I find it a bit exaggerated," he says. "I haven't been nearly as successful as Zuck — yet."

Mr Gal started his first business — a software development company — as a teenager in his bedroom in Bucharest's suburbs and soon gained a taste for innovation; he is now on his third tech company.

"The only job I ever had was as a web developer for a few months — I realised pretty quickly it wasn't what I wanted, so I set up my own company at 18. I never really questioned whether I should do it or not," he says.

Mr Gal is founder and chief executive of Brainient, which supplies a tool that allows broadcasters and producers to add interactive content to video clips. He says the company has helped clients increase advertising revenue 30 per cent by making smarter adverts.

Clients range from small content producers to UK-wide broadcasters, such as ITV, Channel 5 and Sky.

Mr Gal's story is emblematic of Romania's growing reputation as a low-cost location with a large pool of skilled software developers and engineers.

The country's universities and technical schools produce more than 10,000 engineers a year, says Mr Gal. This reserve of talent has attracted companies such as Microsoft, Adobe and Oracle to the country.

But making the leap from bedroom start-up to global tech company is not easily achieved in Romania. Observers note that a lack of capital, uncertain regulatory conditions and an aversion to risk have forced innovators such as Mr Gal into leaving their homeland to develop their companies.

Now based in London, Mr Gal points to a mixed inheritance from Romania's

communist past. "I believe we can turn Romania into an eastern European tech hub, because we have tremendous technical talent," he says. "The engineering schools from communist times are still of an excellent standard. But we need more capital and we need to tackle this cultural reluctance to take risks."

Romania's government has taken steps to support entrepreneurs who want to build and maintain start-ups in the country, rather than merely working for one of several large multinational tech companies based there.

Bucharest, Timisoara and Cluj-Napoca have been identified as priority zones for technology business by the authorities. There have been some significant successes, not least the sale in 2014 of LiveRail, a video advertising technology company, to Facebook for an undisclosed sum.

Two of LiveRail's three founders are Romanian and the company's first development team was based in Cluj-Napoca. LiveRail's success and a government-backed scheme to create a tech cluster have sparked ambitious talk of transforming the city into a "Romanian Silicon Valley".

But the full story of LiveRail, which moved its development team to London shortly after it was acquired by Facebook, offers a more sober picture of the challenges Romanian tech companies face in maintaining links with their home country while pursuing broader ambitions.

Mr Gal says: "Tech talent is one of Romania's best assets but the authorities have a ton of other problems they are dealing with. They need to do more to encourage start-ups and persuade them to stay there."

He would like to see the authorities recognise limitations, including a venture capital shortage and infrastructure gaps. A focus on Bucharest, with its international transport links, and the creation of regulatory certainty, would help Romania move up a gear in tech innovation, he says.

"Investors are acknowledging the country is getting better from a policy and talent perspective," he adds. "That should build momentum and make investors less reluctant."

"The more success we have, the easier it will be for the next batch of companies to find funding."



Emblematic:
Emi Gal's success
highlights his
country's growing
reputation as a
technology location

The region can position itself as a champion of clean energy and new technology while contributing to climate goals

Southeast Europe can lead the way in clean energy

OPINION

Julian Popov

At the end of 2014, Silicon Valley's Progress Software Corporation acquired the Bulgarian software start-up Telerik for \$262.5m, a huge amount for the EU's poorest country. Two months later, Bulgaria's large Varna coal power plant owned by the Czech energy company CEZ closed because it could not comply with EU environmental standards and remain competitive. These events highlight a battle of generations in southeast Europe.

The region, which can be defined as including up to 18 countries, from Turkey to Italy, has 220m people and covers 2m sq km. Most of the states are entangled in a tug of war between past and future. The struggle stretches from the interpretation of history to industrial policies.

The old guard is pulling back. Governments dream of re-industrialisation, generally understood as the revival of inefficient Communist-era industries. Most countries cling to the idea of becoming regional energy centres. Whether that means building more power plants than the neighbours or hosting more pipelines, the dream survives government and regime changes, wars, EU entries and the turn of a century.

The dream is catalysed by Moscow's strategies to sell nuclear power plants and to penetrate the EU's gas market through southeast Europe in order to suppress alternative gas projects that could squeeze Russia's market position.

Centuries of struggle to create national identities are not helping either. To have an independent energy supply is often seen as strategic priority.

Meanwhile, the clean energy sector is growing fast. With plenty of sunshine, good wind conditions and abundant hydro resources, southeast Europe has great renewable energy potential. Romania has the largest onshore wind power plant in Europe and in 2012, Bulgaria installed more solar power per capita than any other country in the world. Both have already reached their EU 2020 renewables targets. Albania is one of the two European countries with almost 100 per cent renewable electricity; the other is Norway.

The IT sector is also booming. Management consultancy AT Kearney's 2014 Global Services Location Index ranks Bulgaria as the best outsourcing destination in Europe and ninth in the world. A recent analysis of Stack Overflow, a popular coders' online community, placed Bulgaria in a leading position with the highest average reputation among top users in the world. Croatia is in fifth position. Romania and Bulgaria regularly feature in the top 10 countries with the fastest internet speeds.

Clean energy and IT go well together. The future of energy will depend on intelligent systems — from smart meters to complex demand management and regional power markets. Italy was the first country to install smart meters in almost all households.

Austria is the first European state to launch a smart meter solution linking the energy and telecoms sectors.

The two old EU members play a significant role in a region where they are successful investors.

However, there is a big difference between energy and IT. While IT is predominantly entrepreneurial and independent of the state, energy is dependent on politics, regulation and regional co-operation. None of these work in favour of the entrepreneurial potential of the Balkans. The Energy Union process might help. The European Commission recognised southeast Europe as a region with high energy efficiency and renewables potential that needs urgent action. It also branded it as vulnerable and started a drive to make the energy sector more transparent.

Until recently, southeast Europe was treated primarily as a gas corridor — a simplistic view that ignores the vulnerability of the region and its economic and renewable energy potential. The region can position itself as a champion of clean energy and new technology, boosting the economy and security while making a significant contribution to European competitiveness and climate goals.

If the Balkan countries step back from their old dreams of energy supremacy and act with more transparency and entrepreneurial spirit, they could leapfrog into the future of interconnected, clean and efficient energy use.

Julian Popov is a former Bulgarian minister of the environment.

Central & Eastern Europe Emerging Industries

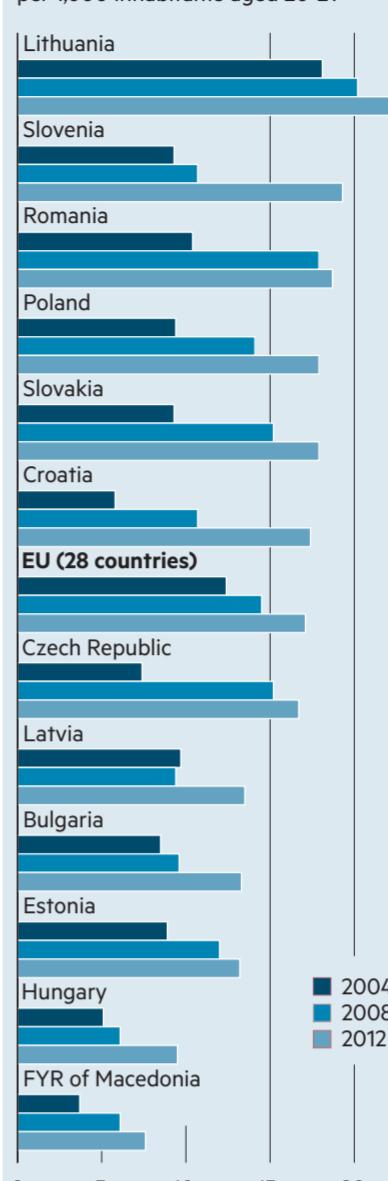


Investment, research and high-technology industries

Research & development spending
Gross domestic expenditure on R&D as a % of GDP, 2013

Science and technology graduates

Tertiary graduates in science and technology per 1,000 inhabitants aged 20-29



Innovators are hungry for a piece of the action

Continued from page 1
produced 23 science and technology graduates per 1,000 inhabitants aged 20-29, the highest number in the EU.

But two factors necessary to build thriving innovation and entrepreneurial clusters are holding the sector back. Financing, especially for early-stage investment rounds, can be tough to find, stifling growth at a business's nascent stages. Also, a developed and reliable network of resources and infrastructure is yet to emerge, meaning that start-ups can feel isolated and unsupported.

Pawel Tomczuk, an entrepreneur now helping Polish companies to grow abroad, is exploring ways to match successful expatriates with entrepreneurs back in central and eastern Europe who could learn from their expertise.

"There are great ideas and concepts here, but the support infrastructure that people take for granted in places like Silicon Valley is lacking," he says. "But often there are people out there who have the experience and desire to help develop new businesses."

For others, those limitations mean that start-ups can be impatient, and fail to develop their businesses.

"We are 20 years behind somewhere like Israel," says Lukasz Wejchert, founder of Dirlango, a start-up incubator. "There is a little too much hope. People want everything to happen so fast."

Mr Sylkusi at Trigon agrees: "You have many whizz kids with great ideas.

But there are many great ideas around the world. You need to have traction.

"If you go to these start-up fairs, they say: 'We have a great idea. We have no customers. We think we are worth 10m zloty'... I just say: 'Thank you for your time. Don't call me.'"

Funding is a commonly cited obstacle for small businesses. The lack of a mature venture capital industry does not help, while limited research and development means less money is available for innovation.

Central and eastern European EU states spent an average of 1.2 per cent of GDP on R&D in 2013, according to the most recent figures from Eurostat. That compares with an EU average of 2 per cent, and spending in countries such as Germany and Austria of 2.8 per cent.

Small businesses can also feel hampered by bureaucratic requirements and regulations that linger as a hangover from communism.

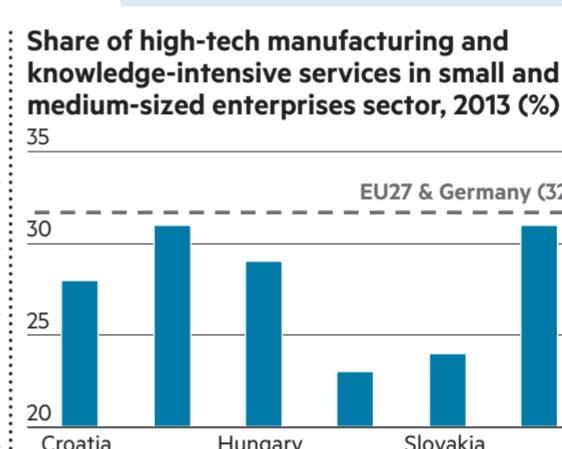
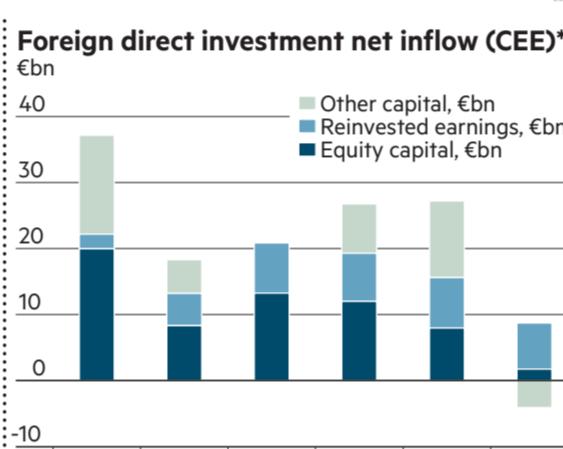
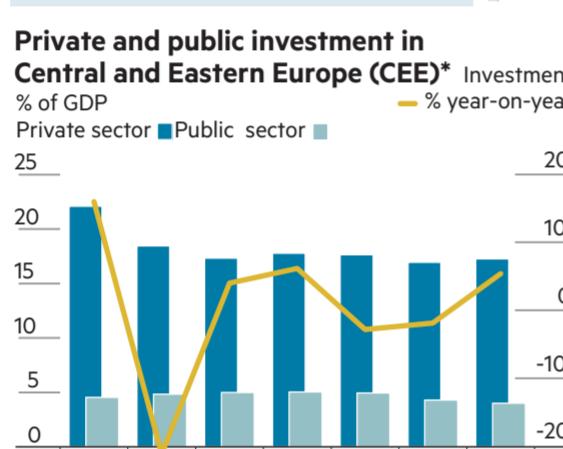
Efforts are under way to address some of these issues. Pledges have been made to increase R&D spending, and the new €315bn fund for development projects being championed by Jean-Claude Juncker, president of the European Commission, should also help innovators.

In February the Visegrad Group of Poland, Hungary, Slovakia and the Czech Republic agreed to establish the Visegrad Patent Institute, a one-stop shop for innovators. Initiatives such as the Deloitte Fast 50 and the New Europe 100 have provided platforms to promote entrepreneurs and allow them to make connections.

'[We lack] the infrastructure people take for granted in places like Silicon Valley'

Intra-regional competition is also forcing governments to make things easier for their innovators. Lithuania, envious of neighbouring Estonia's new businesses, plans to borrow Tallinn's approach and investing heavily to support digital developers.

"Accelerators and investment help local talent take their ideas to the next stage, by supplying them with assets, industry knowledge and contacts around the world," says Don Grantham, president for central and eastern Europe at Microsoft, which is supporting Lithuanian business startups such as IT For You, a music player application.



Poland's brightest strive to fulfil their potential

Start-ups Young entrepreneurs seek scope for their talent in the small home market, writes Zosia Wąsik



Winners: the Audiotrip team with 33entrepreneurs' Vincent Pétré (right)

Audio travel guide app is a resounding success

A Polish start-up that streams tourist audio guides to smartphones was the runaway winner at 33entrepreneurs' inaugural Warsaw talent competition. AudioTrip won a mentoring week in Bordeaux and a shot at €250,000 of equity funding.

The application, which lets users create and upload tours for others to download, was built in Poland but its developers want it to have a wider use.

"The main problem is the size of the Polish market. Our potential clients often do not have enough money to co-operate with us," says 26-year-old Maciej Frankowicz, the start-up's head

of business development. "We want to launch in the most 'touristic' countries. Great Britain and France would be our natural first choices."

AudioTrip sees its biggest market in public institutions such as museums and zoos, and business-to-business sales are currently the main source of revenue. So far, the company's portfolio includes 200 guides in 20 countries and more than 20,000 users have downloaded.

The commentary for Warsaw zoo, created a month ago, has been listened to more than 1,000 times. **ZW**

and build awareness among politicians, academics and other businesses. "We should not expect it will immediately become a second Silicon Valley."

Poles certainly display an entrepreneurial streak. Tired of working for somebody else, young people say in surveys that they prefer to use their skills to start their own projects. According to a study by Gfk, the research group, 77 per cent of young Poles believe that they can learn entrepreneurship and 56 per cent that they are capable of running their own business.

Poland is also noted for its deep pools of technology and IT talent. Its programmers often win international IT competitions. One of their recent successes was at last year's Hello World Open coding championships in Helsinki, where a Polish team beat more than 2,000 teams of programmers from 92 countries.

However Poland still has to fulfil its

potential. Entrepreneurs complain about a lack of funding and insufficient co-operation between incubators, business and universities.

"There are only some 70 venture capital firms in the country," says Ms Kruckowska. "This number is rising, but there is a long way to go to match western start-up hubs."

Young start-up founders say the Polish market is too small, legislation too complicated and commercial customers too wary of newcomers for them to develop their businesses. They want to operate in foreign markets, especially the US or UK.

Attempts are being made to smooth out those problems. This month, an accelerator, Business Link Narodowy, will open at Warsaw's National Stadium, providing working space for start-ups. The world's third Google Campus, a hub for entrepreneurs to meet and work, is also due to open in the city this year.



PORR scores with intelligent growth also in CEE

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The acquisition of a majority interest in UBM Realitätenentwicklung AG last year provided PORR with the opportunity to spin off all real estate activities from the construction business. As a result, two independent groups of companies have emerged that are listed on the stock exchange and have distinct company profiles. With capital being no longer tied up in development projects and the discontinuation of non-core real properties, PORR improved its

key balance sheet and revenue figures and was free of net debt for the first time in its history at the end of 2014.

For years, PORR has pursued an intelligent growth strategy – doing business with a focus on quality, profitability and sustainability. PORR's profound know-how, innovative capacity and willingness to continuously improve are the basis of top quality. In addition, national and international partnerships secure the company's technological edge.

Last year, the company's creditworthy domestic markets – Austria, Germany, Switzerland, Poland and the Czech Republic – accounted for around 93% of its operating performance. In these countries PORR is present with its full range of services. In selected CEE and SEE project markets its portfolio also includes premium infrastructure products. The list of countries is joined by the international market of Qatar. The company has always lived up to its motto "Know your market and know your customer".

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Central & Eastern Europe Emerging Industries

How Estonia set the pace on the way to digital government

Technology David Crouch talks to the country's 'ambassador' for e-governance about pushing boundaries

When Ivar Tallo was due to return to Estonia after working abroad for the UN, his wife needed a job. After two hours sitting at their kitchen table in Geneva, they had created a graphic-design company for her from scratch, with no agents, lawyers, meetings or pieces of paper involved.

The ease of establishing a business is just one of the attractions of Estonia's digitised governance system, in which citizens bank, vote, park, sign contracts and pay taxes with clicks of the mouse or taps on their mobile phone screen.

In May, the country became the first in the world to offer a secure digital identity to non-Estonians anywhere on the planet by acquiring "e-residency" status, enabling them to register a company online, perform e-banking transactions, make international payments, declare taxes online and sign documents digitally.

For more than two decades, the former nations of the Soviet Union have grown accustomed to taking lessons from the west about how to run their economies, governments and societies. But now the boot is on the other foot – at least in this small Baltic state which is putting the internet at the heart of commerce, governance and politics.

"When the Soviet Union collapsed and we won our independence, we wanted to be like the west but we didn't know exactly how you do things. So we did it our own way and it was a bit different," says Mr Tallo, the founder of Estonia's e-Governance Academy and a roving ambassador for the country's digital experiment.

This historical accident, which left Estonia without any banks, meant it had to establish new systems with new people and technologies, enabling the country to leapfrog nations with established back-office systems for finance and government.

With a stated ambition to become as renowned for its digital services as Switzerland is for banking, e-governance is a foreign policy goal for the country of 1.3m people.

"This is pure logic, not just some empty aspiration," says Mr Tallo. "Government is mostly about communication, so if communication has changed then governments will change also. It is going to happen anyway – it is just a

question of whether we can shape it."

Whether requesting a visa or registering for maternity leave, electronic authentication is sufficient to authorise any state service. Business deals and transactions are also concluded with a digital signature.

Estonia's e-residency scheme is eye-catching

but still largely "decorative", Mr Tallo says. Far more substantive is the interest in other EU nations in the way public and private sectors in the country exchange data and interact with each other to provide services efficiently.

The system relies on a secure digital identity. An authentication certificate is embedded in a chip in each citizen's electronic ID

card with an accompanying pin number, and also in their mobile phone's SIM card, creating a unique digital signature.

But technology is not enough – there must also be a high level of trust in the system among its users. With electronic banking available since 1996, Estonians have had almost 20 years of trusting their money to the digital sphere, making it easier to extend it into other areas, such as taxes and ultimately elections.

When the country introduced internet voting in 2005, only 2 per cent of the electorate opted to cast their vote online, but at this year's general election it was closer to 32 per cent.

"By raising the level of trust in society in general, it changes the climate of doing business," says Mr Tallo. "And that lowers transaction costs, which raises GDP growth."

Estonians have used their digital signatures 218m times since the scheme's inception in 2002, with no serious breach of security so far. Indeed, the US National Security Agency, at the centre of spying accusations since Edward Snowden's revelations last year, is unhappy that it cannot eavesdrop on communications, Mr Tallo says.

But with so much crucial information in the cloud, there are inevitable concerns about vulnerability to cyber attack and fraud. Last year, researchers claimed the electronic voting system was flawed, and the opposition Centre Party has campaigned against it.

"Yes, there have been moments when people hesitated, and there have been problems with data protection," says Mr Tallo. To strengthen confidence that information is not misused, people can check their own data online and ask who has accessed it and why.

There are glitches. Journalist Raimo Poom at the Eesti Päevaleht daily expressed his frustration on Twitter last month when two browsers refused to authorise a payment. It felt like things were going back to the 1990s, he said.

But the direction of travel in Europe is clear, and Estonia is positioning itself as a trendsetter. The UK signed a memorandum of understanding with Estonia two years ago to share expertise on digital governance, while Brussels is looking closely at what it can learn.

"Being digital is a way of overcoming the handicap of smallness," says Mr Tallo. "It has a genuine appeal. We have found a lot of people trying to emulate us and we are very happy about that."

City hopes high-tech will restore past glory

Outsourcing

Bulgaria is becoming a leader in the field, Theodor Troev and Angel Petrov report



Historic: Plovdiv's ancient theatre

The city of Plovdiv, dating back 6,000 years and rich in archeological treasures, is regaining some of its former cultural and economic prominence.

In 2019, Bulgaria's second-largest city, studded with Roman theatres and still a powerful economic force in the communist era, will become a European Capital of Culture. Meanwhile, its GDP is growing by 12-13 per cent a year, one of the fastest rates in the country. Much of this can be attributed to an IT and outsourcing boom, supported by local authorities and national government.

Ivan Totev, the city's mayor, says: "My dream is to see Plovdiv's renaissance as both the industrial and cultural hub of Bulgaria." Mr Totev backs initiatives from the private sector to develop the city as a fast-growing outsourcing and IT destination and says that tens of thousands of graduates in the next few years will help attract many new jobs.

Plovdiv is an example of the country's thriving outsourcing industry, accounting for almost 4 per cent of GDP, according to the Bulgarian Outsourcing Association (BOA). Bulgaria is the world's ninth "most preferred" outsourcing destination in consultancy A T Kearney's 2014 Global Services Location Index.

Fluency in languages and traditions in software development and programming are a draw, while macroeconomic stability and a currency pegged to the euro add to the country's appeal. Outsourcing employees' wages are low compared with western Europe, but allow a better quality of life than most sectors.

Investors have been attracted to the Plovdiv area in part by the Trakia Economic Zone (TEZ), a public-private partnership comprising six industrial zones clustered in and around the city. Companies are enticed by comprehensive infrastructure and fast-track procedures. TEZ is Bulgaria's first such area to receive focused state support, which allows even small municipalities to apply for project funding from the national budget or EU programmes.

Investment into TEZ projects has topped €1bn since its zones started to grow in the 1990s, with another €800m expected in the next 10 years.

"We're conservative in these estimates, the interest is steadily growing," says Plamen Panchev, TEZ managing director and chairman of construction group Sienit Holding, which played an important role in creating the TEZ.

More than 100 investors, most from Europe, have been drawn by business-

friendly legislation, low labour costs and the 10 per cent flat tax that Bulgaria offers foreign companies. Among them are ABB, the Switzerland-headquartered power and automation group, and German supermarket group Kaufland.

A "smart city" project to boost energy efficiency and cut industrial waste in a TEZ zone is being developed with Germany's Fraunhofer Institute and China's Huawei. Another Chinese company, Hainan Longquaren Century Invest and Development, is TEZ's partner in a Euro-Chinese Economic Development Zone aimed at attracting more Chinese investment by establishing a logistics hub linking Asia and Europe.

TEZ has employed 12,000, including jobs for residents in poor rural areas, which initially provided more workers. However, lack of qualified employees is a problem, although there are attempts to remedy this. Ivaylo Staribratov, who chairs the Information and Communication Technologies Cluster, has pushed for curricula at some universities and vocational secondary schools to match better the requirements of the IT sector.

Other cities, such as Veliko Tarnovo in north-central Bulgaria and Varna and Burgas on the Black Sea, are also benefiting from the growth in outsourcing.

The foreign presence is expanding. HP, the US technology conglomerate, opened a lab in Sofia, for example. In Sofia alone, some 20,000 people are available to take up junior outsourcing positions – about the same number working in the sector nationwide.

"The potential we have could double the share of outsourcing in GDP in the next three to five years," says Stefan Bumov, BOA chairman and chief executive of Sofica Group – the largest Bulgarian-owned outsourcing company, bought by US-based TeleTech last year.

Ilia Krastev, chief executive of A Data Pro, a content, data and business intelligence services company, adds falling birth rates and education as challenges "that could put a brake on sustainable growth". He says Bulgaria must make it easier to hire foreigners, stop a brain drain, attract natives who graduated abroad and improve quality of life.

EU teams aim to help countries rethink research and innovation

Policy

Hungary is among the first to take advantage of expert advice to overhaul its system, writes Andrew Byrne

Hungarian leaders often speak with pride of the innovations the country has given the world: the ballpoint pen, the espresso machine and the Rubik's Cube.

"[Hungarians] do everything differently, and always seek to find new solutions, leading to the birth of inventions," prime minister Viktor Orbán told an audience in May.

But Budapest's decision to seek outside advice on its research framework from the European Commission's new Policy Support Facility (PSF) suggests this pride is tempered with a realisation the country is not reaching its potential.

Hungary is one of the first countries to use the PSF, launched in March by Carlos Moedas, EU commissioner for research, science and innovation. The decision highlights growing awareness in central and eastern Europe of a research policy and institutions gap, with western countries receiving the lion's share of EU research funding while others struggle with limited resources.

Bulgaria has applied for an intensive peer review, while Hungary has requested a preliminary audit of its system for funding and guiding research by leading industry experts.

"The initiative is designed to support member states in reforming their national science and innovation systems by offering public authorities tailor-made advice by international experts on a voluntary basis," Mr Moedas told reporters at the launch in Brussels.

Hungary is a "moderate performer" in

research and innovation according to the commission. This puts it below the EU average on indicators including innovations, non-European doctorate students and product innovation among small and medium-sized companies.

József Palinkas, Hungary's research and innovation chief, asked the PSF to help bridge the gap between scientific research and the market.

He says: "Hungary is performing acceptably in research, but the transfer from applied research is not as it should be... My first hope is for advice on what to change and how to ensure better tech transfer from research into industry and services."

Mr Palinkas says the three independent experts, who have been meeting scientists, researchers and industry representatives since May, should also advise him on how to design a competitive and transparent research funding system, based on lessons from the UK and the Netherlands. The group will also provide advice on how to reduce the gap between basic research, applied research and innovation.

Hungary's institutes are well placed to connect with industry; there is a sizeable car sector with companies such as Mercedes, Audi and Skoda. Local pharmaceutical company Gedeon Richter also works closely with the country's research institutes to develop drugs.

Researchers face challenges however. The government has cut research funding since 2009. Spending on research and higher education fell from 0.46 per cent of output in 2007 to 0.41 per cent in 2013, below the EU average.

Driving force: commissioner Carlos Moedas says a new EU scheme will help improve research



Getting expert advice on how to spend effectively is crucial for the policy support team; Mr Palinkas hopes it will help him win support for reforms from researchers and government.

Although the group's recommendations are not mandatory, adopting best practice is vital for countries seeking investment from Horizon 2020, the EU's €80bn research and investment fund.

"The process is also about convincing the research community and government how we can make a competitive research funding system work independently and transparently," says Mr Palinkas. "You can always ask for more resources but it helps when you can show the system is working effectively and transparently and produces results."

Analysts caution that while expert strategies and advice are useful, many European countries would need to invest in new administrative structures to put strategy into practice.

Miroslav Beblavý, head of the jobs and skills unit at the Centre for European Policy Studies, a Brussels think-tank, says: "You can pay the best consultants to write the best analysis, but if the national bodies don't have the capacity to absorb and dispense funding effectively, then you have the problem of systems that are low in funding, badly run and politicised."

He adds: "Central and eastern European countries need to catch up with western counterparts in managing research and innovation funding."

The commission's experts are expected to provide advice on how to design and manage these processes.

But officials noted the expert report will be a voluntary document without enforcement tools. Mr Moedas has acknowledged that winning high-level political commitment will be crucial to the success of the review. This means the reform process has only just begun.

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Mitsubishi Materials Techno Corporation and GEOTECHMIN Group - a Successful Example of B2B Partnership

A modern wastewater treatment facility in Ellatzite mine, which operates using an innovative technology of Mitsubishi Materials Techno Corporation (MMTEC), has laid the beginning of a beneficial partnership.

MMTEC, a longtime leader in the design, installation and maintenance of various water treatment plants in Japan, took its first successful step into Europe in 2014. The technological trials of the new installation started on 5 September 2014 on the territory of Ellatzite mine - one of the biggest open-pit copper mines in Bulgaria located in the region of Etropole. The wastewater treatment facility is the first one in Bulgaria which has adopted this innovative technology of the Japanese company MMTEC.

The construction of the new wastewater treatment facility is a project under the Environment Protection and Recovery Programme for the Region of Ellatzite Deposit for the period 2010 - 2014. It is part of a complex wastewater management system on the territory of Ellatzite mine, which is to be completed in 2017. The highly efficient treatment method of sludge recirculation, which will be applied in the new installation and the high level of automation will ensure allowable pH values and will keep the concentration of heavy metals and suspended solids below the normative limits for discharge into the Malak Iskar River. The regular exploitation of the new

facility will improve the condition of the Malak Iskar River in the discharge area of treated waters. Therefore, the project is warmly supported by the local authorities. Dipl. Eng. Bogomil Georgiev, Mayor of Etropole, emphasizes that with the implementation of this project GEOTECHMIN Group and its subsidiary Ellatzite-Med AD have proved their responsibility towards environmental protection and local residents' health.



B2B partnership between a Bulgarian and a Japanese company

The news about the start-up of this wastewater treatment facility is that for the first time in Europe a technology of Mitsubishi Materials Techno Corporation has been adopted. This is a successful example of B2B partnership between a Bulgarian and a Japanese company and

the first large-scale project financed with Bulgarian private investment - by Ellatzite-Med AD.

The WWTP project started in 2009 by signing a technical cooperation agreement for design, construction and commissioning of the facility. The Japanese engineering company, which has built more than 20 wastewater treatment plants, has been exercising strict supervision not only during the project execution, but also for a continuous period after commissioning.

"Our joint intentions with GEOTECHMIN Group are to build together such mine wastewater treatment plants not only in Bulgaria, but also in the neighboring countries," says Mr. Yoshiaki Inaba, President of MMTEC. And he also adds "In 2013 we signed a framework agreement for technical cooperation and now in 2014 we are working on a joint pilot project for water purification by adopting a most advanced technology developed by Mitsubishi Materials Group."

H.E. Mr. Takashi Koizumi, Ambassador of Japan to Bulgaria hopes that, in cooperation with Geotechmin, Mitsubishi Materials Techno Corporation will continue to use its remarkable technologies and expertise in the wastewater management sector by applying them in Bulgaria and other countries.

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