Central and Eastern Europe

Technology & Innovation

Tuesday November 15 2016

www.ft.com/reports | @ftreports

Young talent leads a push into an age of enterprise

The region has become acutely aware of the need to hang on to its best and brightest, reports *Henry Foy*

Breeding unicorns: CD Projekt, maker of the Witcher games, is one of Poland's success stories — CD Projekt

It is a feature that has brought billions of hours of fun to Snapchat users. Want to have a rainbow flow from your open mouth? How about replacing your eyes with big pink love hearts? Turn yourself into a dog complete with cartoon tongue?

If your social media feed is filled with photos of your friends sprouting fluffy rabbit ears or transforming themselves into zombies, it is likely a group of Ukrainian app developers are to blame. The facial recognition start-up Looksery was dreamt up in eastern Europe and acquired by photosharing app Snapchat last year for a reported $150m. The acquisition was the largest technology deal in Ukraine's history.

Almost as quickly as Looksery's technology became an integral feature of Snapchat, the purchase has inspired hundreds of other tech developers in central and eastern Europe.

Since overthrowing Soviet-imposed communism more than a quarter of a century ago, central and eastern Europe has mainly relied on low-cost manufacturing and primary industries like mining and agriculture to fuel its strong economic growth and bridge the wealth gap with western countries.

Over the past five years, however, the region's top economies have been striving to move from traditional industry to businesses focused on innovation, technology and entrepreneurialism.

While governments fear the "middle-income trap", where rising living standards bring wages up to a level where manufacturing is no longer competitive enough to entice investors, they are also keen to keep the brightest minds from joining the millions who have emigrated from the region over the past decade.

> 'There is no manual on how to transform a traditional economy into an innovative environment'

"Let us invest in research and innovation, let us prepare our society for [young people], to provide them with opportunities to be here," Slovakia's president, Andrej Kiska, said this month. The priorities, he added, would be "education and research and development, and innovation and start-ups".

Looksery, which Snapchat rebranded as Lenses, is not a fluke success. Others include Estonia's Skype and TransferWise; Poland's game developer CD Projekt; and, from Hungary, presentation software by Prezi.

"We are working all across Europe, the Middle East and Africa and there are huge opportunities here in [eastern Europe]," said Google's European president, Matt Brittin, recently.

But despite a number of initiatives, such as state-backed investment funds, tech hubs and support from international technology companies, output in eastern Europe still lags behind start-up centres such as London or Berlin, to say nothing of Silicon Valley or Tel Aviv.

"There is no manual on how to transform a traditional economy into an innovative environment," says Marek Rosinski, partner at the Warsaw office of lawyers Baker & McKenzie. "This is not an easy or obvious process . . . The creation of a new ecosystem takes time," he adds. "Certain elements may take even a generation to change."

The EU's European Innovation Scoreboard for 2016 shows no eastern member state with more than the bloc's average rating. The eastern region accounts

Continued on page 2

Inside

Flying motorbike concept takes off

Hungary The 'tricopter' will fly one person for an hour at up to 100kph and cost €100,000, writes *Adam Easton*

Hungarian entrepreneur Balazs Kerulo's idea to create a flying motorbike came to him when he read a blog claiming that a drone capable of carrying a person could never be built.

"It was a big challenge to us," Mr Kerulo says. "We made some calculations and found that it was possible, so we tried to get some funding.

"Within a couple of months we managed to lift one man in the air. We put it on YouTube and we got more than 1m views within a week."

The project won Mr Kerulo a place on last year's New Europe 100 list of central and eastern Europe's brightest and best people, and a year on, the flying motorbike concept has funding and a research team working on it.

Called a Flike, it is a tricopter, a machine with three rotor disks, powered by a hybrid electric engine. Once completed, it will be able to fly one person weighing up to 100kg at speeds of up to 100kph for one hour.

Mr Kerulo's company, ByeGravity, based in Budapest, plans to market the Flike for about €100,000 by the end of next year. Users will need to have a microlight pilot's licence to fly one.

"I think personal flight has been the collective vision of mankind since the invention of science fiction," he says. "In science fiction movies since the 1940s you can see people flying in their own private flying devices. Mankind is actually expecting something like this to happen."

He envisages a good market in the United Arab Emirates, where there are many people with the right level of disposable income to buy a Flike who "would be willing to put it in their garage next to their fancy cars".

He also sees potential for the machine in search and rescue missions and the rapid deployment of first aid personnel to the scene of an accident or disaster.

Mr Kerulo, 38, dreamt of being a pilot as a child, although he began his career in his father's company in Hungary building prefabricated homes. Later he studied at Hungary's only state aviation school, where he became an aeronautics engineer and qualified pilot.

While he was working at Bay Zoltan, Hungary's leading network of applied research institutes, he took up the flying motorbike challenge. Bay Zoltan provided initial funding.

The YouTube clip attracted a private Hungarian investor to the project, allowing Mr Kerulo and a colleague to leave Bay Zoltan last August to launch ByeGravity. It has four full-time staff and more than a dozen research subcontractors working on the Flike design, with enough capital to fund building the first prototype. Mr Kerulo hopes to attract a multinational venture capital investor to bring the project to market.

'Mankind is actually expecting something like this to happen'

ByeGravity originally planned to have a pre-release product available this year but has encountered some problems during prototype testing. It was unexpectedly difficult to build the computer that turns the pilot's movements on a joystick into commands for the six motors powering the rotor blades on the machine's three wings.

The second problem was enabling the aircraft to stay airborne for an hour.

"The batteries drain within ten minutes of flight," says Mr Kerulo. "So we have a range extender on board, which is actually a large internal combustion engine connected to a generator."

This produces energy that charges the batteries during flight. The longest flight to date has lasted 15 minutes, which will be greatly increased if the new range extender performs as expected, he adds.

Test flights have been taking place in a field in north-eastern Hungary close to the border with Slovakia. Flight is limited to the field's perimeter, however, because the Flike does not have a permit to go beyond it.

Riding high: the Flike will fly at a altitude of up to 30m

One means of getting one would be for the European Aviation Safety Agency (Easa) or the US Federal Aviation Administration (FAA) to certify the aircraft, although, Mr Kerulo notes, this would be costly and time consuming.

Another way would be to obtain authorisation for private use only. The Flike is electronically limited to altitudes of just 30m, to prevent it from straying into restricted airspace. German competitors Volocopter have already received such permission for their prototype manned flying multicopter from the German Ministry of Transport, Mr Kerulo says.

ByeGravity has been invited to the Consumer Electronics Show in Las Vegas next January and is hoping to demonstrate the prototype publicly.

Mr Kerulo admits public acceptance will be an issue but notes there was also fear and scepticism around cars when they first appeared on the roads — the first automobiles had to have someone run in front of them waving a red flag to warn everyone a car was coming.

He sees the first flying bikes being used in uninhabited areas.

"I think this technology will creep into cities in the next 20 or 30 years but I foresee that it will take another 40 to 50 years for it to become as common as cars are now," he says.

Young talent leads a push into an age of enterprise

Continued from page 1

for the bottom eight places. According to the findings, countries in the east produce large numbers of well-educated graduates with science, IT and engineering degrees. But, overall, the region lacks research and development spending as well as access to investment capital and has only a limited number of successful start-up companies.

"You need the push from the market, so bottom-up rather than top-down," says Artur Tomala, a Warsaw-based managing director of Goldman Sachs. "There is still not the scale of investment opportunities here to bring the big money." Baker & McKenzie's Mr Rosinski agrees: "There is not enough critical mass yet to attract massive foreign investment," he says. But it is "definitely an area to watch closely" and is "largely undiscovered".

At the same time, competing with more established markets might not be the right approach. In an example of how the region can succeed by finding niche opportunities to mitigate its relative lack of experience, size and capital, two Polish entrepreneurs working for PwC, the advisory firm, have set up the world's first drone consultancy project, Drone Powered Solutions. Poland is a good place to be a drone pioneer, in part because of laws that make the country one of the world's most liberal markets for that use.

'[Poles] used to be the guys that physically built things. Now we are becoming the guys that think things up'

Governments are hoping that the booming outsourcing industry across the region will in turn spawn homegrown business ideas, as young people are trained in the offices of global corporates before setting out on their own.

Goldman Sachs, for instance, has an operations centre in Warsaw where some 240 Poles build apps and design systems and platforms for the bank. It expects to increase headcount to 500 next year. "We are part of the innovation supply chain, through essentially providing our very smart people," says Mr Tomala.

"We [Poles] used to be the guys that physically built things and now we are becoming the guys that think things up."

NEW EUROPE 100 Challengers for 2016

Zeljko Khermayer Feelif

Watching a documentary about deaf and blind people in 2013 made Zeljko Khermayer realise how lonely and isolated their lives could be. Often this was because equipment that could help them communicate was too expensive. "I felt called to do something about that," the 42-year-old Slovenian computer scientist says.

It led him to create Feelif, a low-cost app that helps visually impaired people read and write using smartphones and tablets.

"Feelif enables [users] to feel shapes on standard touchscreens. A combination of vibrations and voice adds to the experience. With Feelif you can read, listen to and create content," Mr Khermayer says.

Trials with visually impaired people in Slovenia have proved highly successful, and the next step will be commercial development.

"Our biggest challenge is to get Feelif to market as soon as possible. To do that we need to cope with multidisciplinary challenges, from finance to research and development to marketing," Mr Khermayer says. "Blind users who have tested the product have [big] expectations for Feelif: I want to exceed these."

'Blind users have big expectations'

Building the company, Mr Khermayer says he has been forced to re-evaluate his previous focus on technical knowledge.

"Technical skills can be learned: we teach new [recruits], but honesty, diligence and responsibility must be possessed by a person before a new colleague joins us," he says.

While trusting his own judgment on hard skills, Mr Khermayer invites staff input on new recruits. "I can sense a good developer. My colleagues have good sense of personality, so they advise me on that. We all decide together if a new employee fits into our team," he says. "It is not up to me."

Kaspar Korjus Enterprise Estonia

Kaspar Korjus runs a start-up with a difference: it is state owned. "I run the coolest government start-up in the world: e-residency," he says.

The 28-year-old Estonian has headed his country's novel virtual residency project since its inception just over two years ago. It allows anyone in the world to create a secure, government-issued digital identity allowing them to register a company online, perform e-banking transactions, make international payments, declare taxes online and sign documents digitally. Mr Korjus's goal is to create 10m Estonian e-residents by 2025 — ten times the country's natural population.

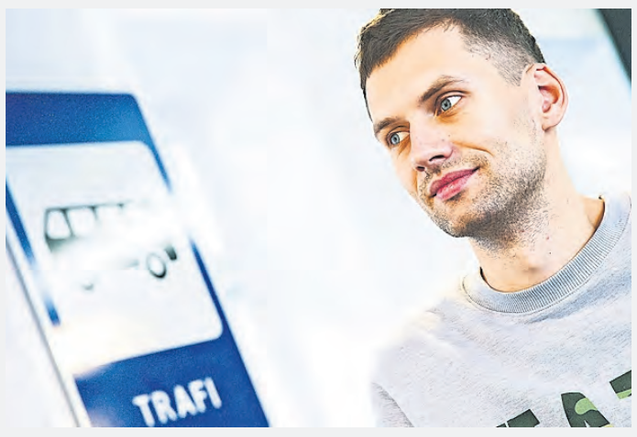
'I run the coolest government start-up'

Almost two years on there are some 14,000 e-residents in total, led by Finns, at just under 2,500, followed by Russians, at 1,200. Applications from Brits have increased sharply following the UK vote to leave the EU.

Mr Korjus himself has links to the UK: after a first degree in business and management at Bradford University, he stayed on in England for a masters degree in e-business and innovation at the University of Lancaster.

"At Lancaster . . . all day long we just built start-ups, from idea creation to building and fundraising. This experience is now [being] utilised for the Estonian government. My UK education is the reason I am good at it," he says.

He admits that even in Estonia, famed for its readiness to adopt new technology, government departments can still be reluctant to embrace start-up culture. It is possible to be agile and entrepreneurial within government, he says, but there need to be "vision, political support, a dedicated team and a great idea".



Martynas Gudonavicius Trafi

Streets clogged with traffic, cancelled trains and crumbling infrastructure are part of urban commuters' daily struggle.

But for Martynas Gudonavicius, sclerotic transport systems have been a business opportunity — indeed, the more chaos, the merrier.

The proudly patriotic, London-based Lithuanian co-founded Trafi, an app that helps frustrated crosstown travellers plan their journeys and avoid traffic.

"Our combination of scientific algorithms, real-time processing of traffic situations and crowdsourced reports allows us to predict journey durations and arrival times 200 per cent more accurately than our competitors and local transit authorities," Mr Gudonavicius says.

After gaining an MA in business from Kaunus University of Technology in 2011, Mr Gudonavicius moved to London to work with InMobi, the mobile media company. He went on to launch Trafi in early 2013 in Lithuania and neighbouring Baltic states, and soon extended the service into Turkey and Brazil, where it was one of the official apps of the Rio Olympics.

The app launched in the United States in August, and is also available in India, Indonesia, Russia and Taiwan. Thailand, Vietnam, Mexico and the Philippines are next in the company's sights, according to Mr Gudonavicius.

'We predict journey times more accurately'

"These are very large, growing markets, where public transport is a very big problem. Their cities are chaotic, lots of traffic jams, lots of unpredictability," he says.

Trafi raised $6.5m in funding for expansion in May from venture capital investors led by Octopus Investments and signed a partnership deal with Uber, the car-hailing app, in September.

Profiles by Kester Eddy

Contributors

Henry Foy
Central Europe correspondent

Andrew Byrne
Hungary, Romania and west Balkans correspondent

Adam Easton
Contributor

Kester Eddy
Contributor

Zosia Wąsik
Contributor

Maija Palmer
Commissioning editor

Steven Bird
Designer

Michael Crabtree
Picture editor

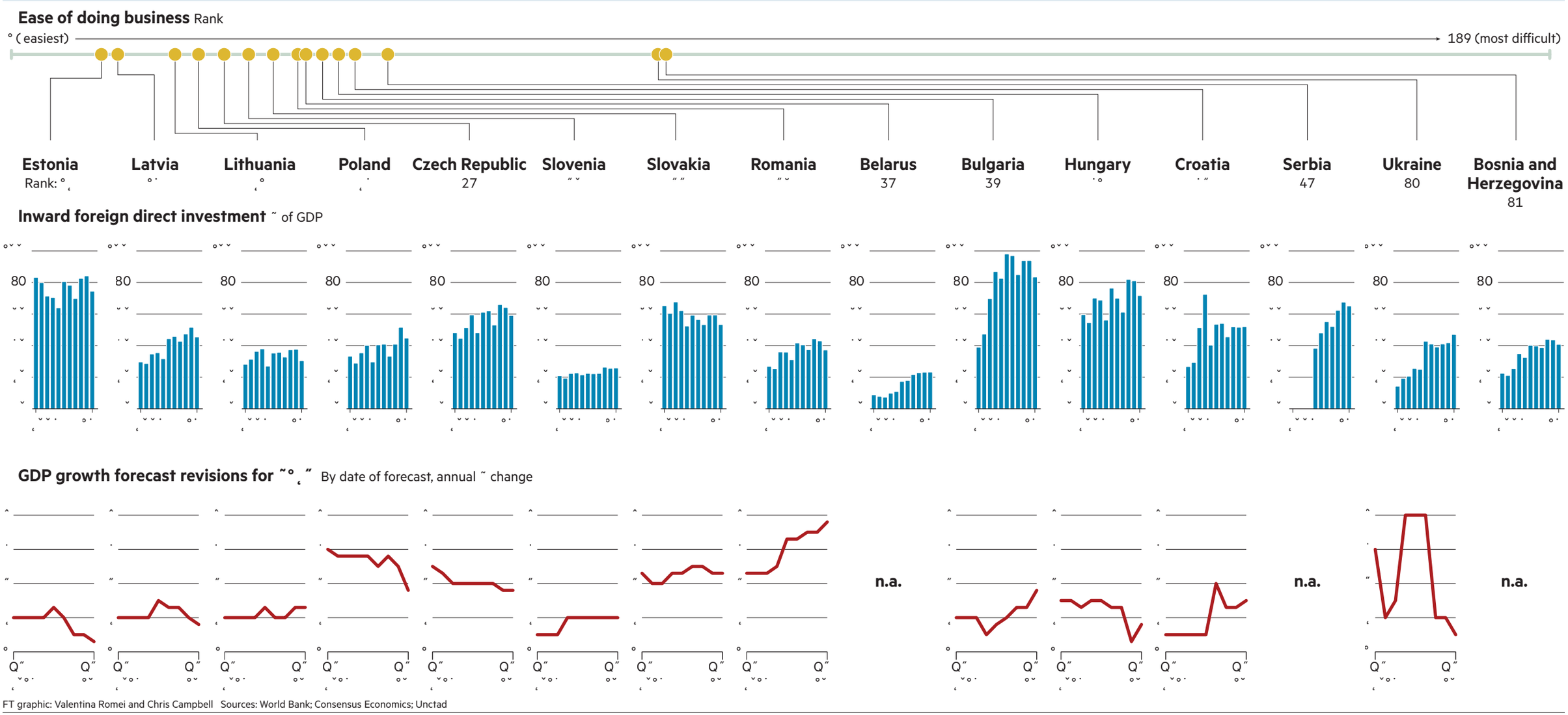
For advertising details, contact:
Vera Huebner, 0049 69 1568 5128 and vera.huebner@ft.com , or your usual FT representative.

All editorial content in this report is produced by the FT. Our advertisers have no influence over or prior sight of the articles.

All FT Reports are available at: ft.com/reports

Follow us on Twitter @ftreports

Central and Eastern Europe in numbers



FT graphic: Valentina Romei and Chris Campbell Sources: World Bank; Consensus Economics; Unctad

NEW EUROPE 100 Changemakers seize their moment in turbulent times

The 2016 New Europe 100 is the third annual list of central and eastern Europe's brightest and best people — plus the organisations who are changing the region's societies, politics or business environments and displaying innovation, entrepreneurialism and fresh approaches to prevailing problems. The aim is to raise the profile of world-leading changemakers in emerging Europe and to build connections among those in the vanguard.

The challengers were selected by Res Publica, the Warsaw-based journal; Google; the state-supported Visegrad Fund promoting integration within central Europe; and the Financial Times. Representatives from these bodies analysed nominations from national institutions, think tanks and the public before selecting a final list of 100 split into the four categories below.

For the complete list and a description of their achievements visit ne100.org.

Join the debate #ne100 and @neweurope100

Society and Politics
29 challengers
Europe's migrant crisis, which has involved 1m migrants crossing through eastern Europe, has caused social and political and social turbulence in the region. Many government officials and social activists have seized the moment to push new initiatives. Officials in Armenia, Estonia and Romania are cutting red tape with e-government programmes, and a Hungarian entrepreneur has set up free online education courses for refugees, while a Polish-Romanian group of ethical hackers is working to protect systems from online threat.

Business
54 challengers
As central and eastern Europe recasts itself as a region for technology and innovation rather than manufacturing and primary industry, young entrepreneurs are tapping strong economic growth in their countries and attracting foreign investment. New businesses include self-driving car software developed in Hungary, the world's first drone consultancy, based in Warsaw, a Romanian levitating hoverboard and an array of fintech start-ups changing the way consumers manage their money.

Media and Culture
7 challengers
Independent news websites, investigative journalism portals and community magazines have risen in prominence in recent years as the media environment turns more restrictive and mainstream channels are divided between state-controlled groups or wealthy oligarchs. Others are exploring virtual reality applications or new architectural approaches. In Prague, the Václav Havel Library commemorates one of the region's most celebrated sons.

Science
10 challengers
An 'iKnife' scalpel that can tell surgeons if tissue is cancerous and a low-cost procedure for rapidly determining blood types are among inventions by scientists in central and eastern Europe. Tapping a large population of graduates and engineers from the region's many universities, this year's list features a number of satellite and space technology companies, alongside a Polish T-shirt with a built in ECG scanner to measure heart abnormality.

Young, multilingual and frustrated with government

OPINION

Henry Foy

Bear market: Anna Skórzyńska is one of 77 Polish challengers recognised

And then there were 300. Three successive years of searching, selecting and honouring 100 outstanding innovators, entrepreneurs and changemakers in central and eastern Europe each year has created a small but dynamic community of people who are shaping the region's future.

The New Europe 100 list has included heads of state, self-made millionaires, social activists and groundbreaking scientists, the inventor of a flying car and a scientist with an asteroid named after her. From Estonia to Bulgaria, the Czech Republic to Ukraine, the innovators come from diverse backgrounds but share much in common. But who is the archetypal New Europe 100 challenger?

Making regional generalisations is a particularly sensitive issue in central Europe — a collection of individual countries often shoehorned into sweeping statements. But armed with a spreadsheet and the responses to a survey sent to the 100 challengers, I went to work.

The results are fascinating. Challengers are on average young, they are — on the whole — choosing to remain in central Europe, they travel widely across the region and speak multiple languages. Also, they rely more on informal contacts for support than their national authorities, and are unconvinced that government is actually making their life as an entrepreneur easier.

In a region where the young tend to lead changes in business and society, it is not surprising that our challengers have a mean age of 36 — so, on average, they were nine years old when the Berlin Wall fell and the region began its transition to democracy. A little over three-quarters are men.

Poland has produced the largest number, with 77 of the 300 challengers identified over three years. The largest economy in the region, with the second-largest population, it is traditionally seen as the linchpin of central Europe, not least in political terms. Its outsized slice of EU structural funds has also helped underpin a growing economy, and continues to make Warsaw the region's hub for raising finance.

The rest of the Visegrad Group — Hungary, Slovakia and Czech Republic — also feature strongly, with 107 challengers between them. While Budapest has sought to claim the title of the region's most innovative capital, government programmes in Prague and Bratislava have ensured start-ups and entrepreneurs are priority issues.

Further north, in the Baltic states, Latvia, Lithuania and Estonia have punched above their weight, underlining their status as among Europe's most dynamic countries for entrepreneurs. Although they have a combined population just one-sixth of Poland's, the three have produced 36 challengers, or nearly half the number contributed by their neighbour.

> Challengers have a mean age of 36 — so, on average, they were nine years old when the Berlin Wall fell

Digging deeper, our survey shows that around 90 per cent of challengers still live in the region, disputing the notion that central and eastern Europe suffers from an exodus of its brightest and best. For those who have moved away, San Francisco and London are preferred destinations.

Three-quarters of respondents said they travelled to other cities in the region at least once a month — 35 per cent visited at least once a fortnight. That chimes with anecdotal evidence that the creation of national hubs for innovation has helped knowledge-sharing and collaboration between the region's innovators. Almost a quarter speak four or more languages. None said they spoke only their native tongue.

Perhaps most strikingly, our challengers echoed an argument heard regularly from entrepreneurs at post-conference drinks and informal lunches. Only 54 per cent said they thought their national government made life easier for them — with the balance saying they thought lawmakers hindered innovation.

Despite attempts by regional governments to portray themselves as supporters of innovation — through campaigns and efforts to cut red tape — criticism of national authorities for stymieing start-ups is frequently heard from Warsaw to Belgrade.

At the same time, 92 per cent of respondents said they thought the European Union helped innovation, suggesting Brussels' funding programmes for small businesses and its efforts to deepen the single market are working well for entrepreneurs.

One area where almost all are in agreement is the potential for expanding beyond their home market. When asked where his concept could expand next, Jakub Jan Fiala, a 19-year-old Czech educational entrepreneur, replied: "Worldwide, probably."

"Possibly everywhere," said Martina Drahosova, head of business development at ixworx, a Slovakian 3D technology start-up.

Diverse the challengers may be, but their ambition is shared and global.

The writer is the FT's central Europe correspondent

Aviation Valley becomes an engine of growth for Poland

Technology

Industry in the Podkarpacie region of south-east Poland savours the novel taste of success, writes *Zosia Wasik*

When Poland's ministry of defence scrapped a $3.5bn helicopter deal with Airbus earlier this year, it shook the French company, angered the country's opposition and caused a small diplomatic war between Paris and Warsaw.

A few days later, however, when Poland's prime minister and defence minister headed to Mielec, a small town in southern Poland, they were welcomed by a cheering crowd.

"The Polish government is strong-minded about purchasing equipment for the Polish army from Polish factories," Prime Minister Beata Szydlo told workers at the local aviation factory.

"International investors helped develop this Polish company and now we can say that this factory is the pride of Poland."

The PZL Mielec factory, owned by Lockheed Martin, produces Black Hawk military helicopters. The Polish government is expected to buy these domestically made aircraft instead of Airbus's French-made Caracal helicopters.

The case shows how Poland's Law and Justice party government values the aviation industry, which is located in the Podkarpacie region in the south-east of the country. Ms Szydlo and various of her ministries often describe it as a role model for other industrial clusters.

The aviation industry in the region, squeezed between Ukraine and Slovakia, has never been an obvious success. In the 1990s, the early years of Poland's economic transformation, the area's unemployment and poverty rates were among the highest in the country. International investors found it of no interest and it was associated mainly with the wolves and forests of the surrounding Bieszczady mountains.

Yet the aviation tradition there stretches back to the interwar period. Factories located in Rzeszow, the biggest city of the region, and in nearby towns, grew during the communist era producing parts for the manufacturing network of the Soviet bloc's Warsaw Pact military alliance.

Those state-owned plants went through a painful privatisation processes at the beginning of the 1990s, as Poland became a capitalist democracy. Investors from abroad slowly arrived, attracted by a cheap supply of labour and an array of small companies engaged in the aviation business.

In 2003, Marek Darecki, head of WSK Rzeszów, now owned by US engine manufacturer Pratt & Whitney, decided to set up an association of aviation factories in the region and styled it Aviation Valley. It started with 18 members, mostly Polish manufacturers from nearby towns.

Today the body's membership stands at 128, made up of 100 manufacturers and other business associations and educational institutions. Nine new plants are under construction.

Employment in the sector has grown from 9,000 to 24,000 over the past 13 years and the annual value of exports has risen from $250m to $2bn. Some 90 per cent of Poland's aviation industry is concentrated in the region.

International companies continue to invest in Aviation Valley. Safran, a French company that produces aviation engine parts in one factory, will open another one together with Rolls-Royce in 2017.

Mr Darecki argues this expansion is "physical proof" of how economically viable the area is becoming. "If a company came here, invested, built one factory and now it is building another one, it means it works," he says.

There are 14 large international companies in the Valley, including Pratt Whitney, MTU Aero Engines, the German aircraft engine manufacturer, and Safran, as well as about 20 medium-size companies. The rest are small family businesses, many of which started out a half century or so ago as locksmith workshops but which have moved into producing complex parts for industry.

'We stare with amazement at Elon Musk. He is the biggest inspiration for us'

These smaller companies comprise a robust supply chain for the region. "The co-operation within Aviation Valley gives us a natural structure of local suppliers," says Janusz Zakrecki, president of PZL Mielec. "This is what attracts new investors."

The bigger factories tend to produce parts that are shipped elsewhere for assembly but, Mr Darecki says, the area is ready to reposition itself. He would like to see the region not only manufacture but also design components.

"This is the moment when Rzeszow should stop playing the cheap labour force card," argues Lukasz Wasikiewicz, a senior manager at professional services company PwC in Poland. He would like to see Aviation Valley move up the value chain and emphasise its expertise.

Corporations in the Valley have begun investing in research and development. Projects are often co-financed by Poland's National Research and Development Centre. Smaller companies in the region can get up to 80 per cent of R&D financed under the 500m zloty (€115m) Innolot funding programme.

Mr Zakrecki says PZL Mielec is working on five innovative projects — for example 3D printing — together with a number of smaller, family-owned companies that would otherwise have struggled to get access to this technology.

Eventually the Valley's companies would like to create an integrated network of start-ups, drawing from clusters in the aviation and IT sectors, which are both present in the region.

"We dream of building a start-up society in Aviation Valley," Mr Darecki explains. "We are staring with amazement at Elon Musk, Tesla producer . . . He is the biggest inspiration for us."

Setting the scene: Budapest was one of the main filming locations for *Inferno*, starring Tom Hanks — Courtesy of Columbia Pictures

The wigmaker who brought Hollywood to Hungary

Film industry Generous tax breaks, scenic locations and high-quality sound stages attract US film crews, writes *Andrew Byrne*

Andy Vajna, one of Hungary's most prominent media tycoons, started his professional life as a wigmaker in Hollywood, where frustration with the poor quality hairpieces available gave him his first big business idea.

"I invented a new wig. I went to Hong Kong to get it made and then imported into the US," he says. "Within a few years, the company was the biggest wigmaker in the world with imports worth hundreds of millions of dollars."

Mr Vajna sold the wig company within a few years and returned to Hollywood, where he won fame as a producer on 1990s hits such as *Die Hard with a Vengeance* and *Evita*.

When later productions failed to match his earlier successes, Mr Vajna returned to his native Hungary to shake up that country's film industry — introducing new models of concept development, film funding and the latest high-tech sound facilities.

In 2011 he was appointed government film commissioner by the prime minister, Viktor Orban. Since then, the 72-year-old producer has more than doubled the value of film productions in Hungary and supported indigenous films that have won global acclaim, most notably the 2015 Oscar-winning holocaust film *Son of Saul*.

Despite his success, Budapest's film elite were initially sceptical of his appointment, he says. "Clearly they saw me as an outsider. The approach for the first few years was: 'Who is this guy? He knows nothing about European culture, he knows nothing about Hungarian film.' Now it has turned around, from 'Where did this guy come from?' to 'What will we do if he leaves?'"

As a senior government official with wide-ranging powers over film subsidy and funding schemes, Mr Vajna has promoted Hungary as one of Europe's fastest growing film locations. Under his watch, total film production spending in Hungary has risen from $144m in 2012 to $260m in 2015. According to the European Audiovisual Observatory's 2015 report, film production in Hungary accounted for 0.15 per cent of gross domestic product — the highest proportion in Europe.

'Clearly, they saw me as an outsider. The approach was: "Who is this guy?"'

At the same time, Mr Vajna owns the pro-government television station TV2 and holds licences to operate all of Budapest's casinos.

Mr Vajna's political ties and his position as a government official with substantial private business interests have attracted some criticism, particularly when he acquired commercial station TV2 in a deal partly financed by a former state-owned lender. He dismisses this as a form of post-communist envy: "It's about throwing stones. Everyone is jealous; everyone has an axe to grind."

Much of Hungary's film success comes down to generous tax incentives — it is one of the most competitive countries in what the European Commission describes as a 'subsidy race' to attract mainly US big budget film productions.

Estonia, the Czech Republic, the UK and Ireland also offer producers generous tax rebates, ranging from 20-30 per cent of eligible expenditure. Films produced in Hungary can obtain a 25 per cent rebate of their direct expenditure in the country. The scheme is administered by Hungary's national film fund and runs until the end of 2019. It has a budget of €402m.

Such incentives are just one of Hungary's attractions, however, including low costs, attractive locations and highly skilled crews, that have made it one of the most successful countries in Europe at luring big productions.

Investment in technical facilities is part of the story. While many productions exploit Budapest's Belle Époque architecture to evoke European streetscapes, science-fiction films such as the *Blade Runner* sequel have been drawn to the Hungarian capital by high-tech facilities built over the past eight years.

"I think we have the best sound stages in the world," says Mr Vajna. "The facilities are better than in Hollywood or Shepperton [in the UK] or anywhere else. That gives us an advantage."

Recent big productions filmed in Hungary include parts of *Marco Polo*, a $90m dramatic series produced in 2015 for Netflix, and the $75m production of *Inferno*, the third instalment in Ron Howard's movie adaptations of Dan Brown's novels, starring Tom Hanks.

Critics argue that lavishing generous tax incentives on big-budget US productions deepens the divide between Europe's fragmented film industry and Hollywood's larger, more integrated production and distribution industry.

A 2014 EU report said that, while subsidies can have indirect benefits, these "do not necessarily enhance the long-term development of the industry". They often help US production budgets at the expense of smaller, indigenous filmmakers. For these reasons, EU rules limit state aid to 50 per cent of the full production budget.

Still, Hungary's film boom has created employment, investment and valuable exposure for Budapest as a film location. Mr Vajna points to a record number of international prizes for Hungarian-made films in 2015 as evidence that both domestic and foreign-financed films are doing well.

He has ambitions to produce more films of his own, and intends to expand his media portfolio as Hungary's politicised media market undergoes a reorganisation, which has sparked international fears of a decline in media freedom.

The septuagenarian shows no signs of slowing down.

"There's all kinds of investment in the entertainment world I want to play with," he says.

Romanian pioneer moves to cash in on cyber threats

Interview Florin Talpes

The founder of Bitdefender tells *Andrew Byrne* that families and small businesses need protection, too

Florin Talpes warns of growing numbers of cyber attacks, describing malware that can take data hostage and transform home devices into "zombie attackers".

The prospect is terrifying for internet users but big business for Bitdefender, the Romanian cyber security company he founded in 2001 and which — as chief executive — he is leading towards a stock market listing.

"The [listing] process will most probably start no later than the beginning of the second quarter of next year," he says.

Allegations of state-sponsored cyber hacking featured prominently in the US presidential election debates and in October a significant distributed denial of service (DDOS) attack on Dyn, a domain registry service, rendered websites including Twitter unavailable to some users.

"We don't know how many of these attacks are state-sponsored, we cannot really estimate accurately," says Mr Talpes in an interview at Bitdefender's office in Bucharest. "Five years ago, the capacity for sophisticated cyber attacks existed in fewer than 10 countries. Now we're talking about several dozen."

Bitdefender is well placed to gain from this rising threat. Romania's largest domestically owned software company employs 1,100 people and says an estimated 38 per cent of global cyber security products use Bitdefender software in some form. The company's admirers include French president François Hollande, who reportedly uses Bitdefender on the presidential computer.

"I'm proud to promote Bitdefender abroad," says Manuel Costescu, who was — until October — Romania's secretary of state for foreign investment. "It's an impressive example of Romanian cyber innovation."

Despite high-profile data breaches at large organisations such as the US Democratic party, small and medium-sized companies with weaker defences are the most common targets of cyber attacks. A UK government study said one-third of small British businesses experienced a cyber breach last year.

Mr Talpes warns that families and small enterprises are the least prepared for ransomware, cyber attacks which block access to a computer system until a ransom is paid — often demanded in a cryptocurrency such as bitcoin.

One reason households are so vulnerable to cyber attack is the proliferation of unprotected smart devices in people's homes — the average is between 15 and 20, says Mr Talpes.

Bitdefender offers consumers a security service that protects all the devices in a home network and plans to launch a similar offering for small companies in 2017. It is also expanding its data centre protection services.

Florin Talpes plans an IPO in 2017

The company has become a role model for local start-ups and Mr Costescu says Bitdefender has helped nurture a tech cluster in the city of Cluj, Transylvania.

However, despite talk of a booming tech ecosystem, Romania's early-stage tech companies face the same venture capital shortage that has stymied peers elsewhere in eastern Europe.

That adds to concerns that the country's large pool of software engineering talent may be drained by multinational IT outsourcing services, instead of producing another Bitdefender.

Most Romanian start-ups that show promise are starved of investment at home and eventually move management operations to the UK or US in order to grow, experts say.

"It's still much harder to find venture capital if staff and operations are 100 per cent based in Romania," says Dragos Stanca, founder of ICEEfest, a tech festival.

Mr Talpes points to signs of improvement in the last five years, with the arrival of venture capital firms like 3TS Capital Partners. 3TS Capital Partners, which operates across central and eastern Europe, has a portfolio of 10 early-stage companies in Romania alone. Still, there is much less venture capital available than in the US and western Europe.

"There are very, very few experienced angel investors with enough liquidity to make a meaningful impact on the ecosystem and even fewer institutional investors who can write cheques of more than $1m," says Emi Gal, the US-based Romanian chief executive of Teads Studio, a video advertising enrichment platform.

'There are very few investors who can write cheques of more than $1m'

But Bitdefender offers a model of a homegrown tech company that can employ hundreds programmers in Romania without shifting core management operations abroad.

Mr Talpes remains coy about some details of his company's IPO, but Romania's start-up founders will hope that Bitdefender's listing might give its founder a bigger role as a potential investor in homegrown businesses.