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Early Stage Report

June 2015

- University best practices
- Corporate liaison
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EARLY STAGE REPORT 2015

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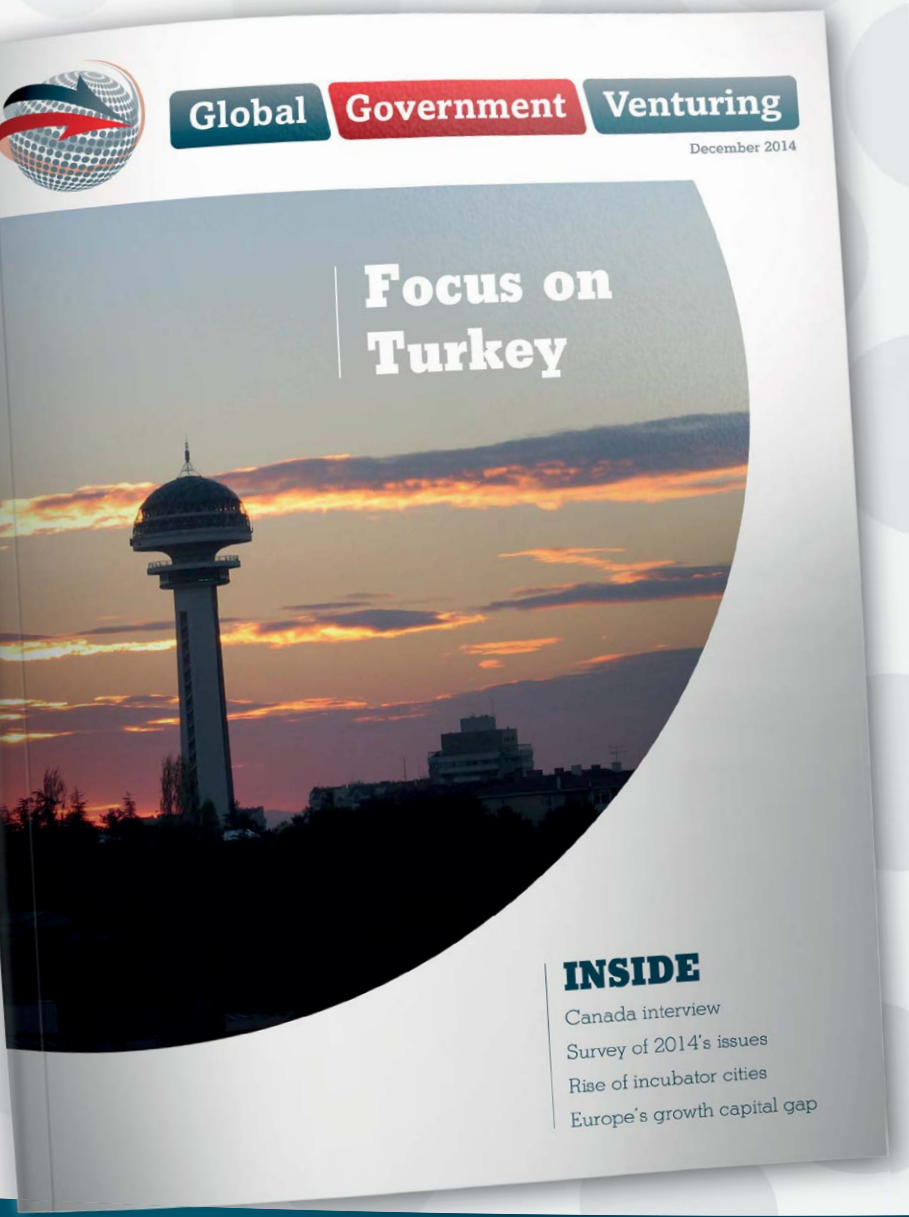

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Foreword

By Shelley Harrison, chairman, Global University Venturing advisory board

While we think we are getting smarter and smarter that is merely a technological advance, not a moral one.

The ideas flowering now, for now, come from the same source of creativity they have always done. As physicist Albert Einstein reputedly said: "The true sign of intelligence is not knowledge but imagination."

Imagination and ideas are sparked by the people around you. And in the competition for the talent that develops and sustains idea capitals – as John Sexton, president of New York University, a few years ago said – universities play an essential role.

But higher education has trouble nurturing successful entrepreneurs, largely due to a failure of providing practical experiences.

The academic-industry liaison creates a reciprocal ecosystem of human capital and research and development for both corporations and universities, develops a localised global network of opportunities and partnerships and empowers new waves of entrepreneurs with resources and experience.

It remains, however, a niche market for human and intellectual capital flow between universities and companies. This is changing.

University venturing is a great vehicle to connect those entrepreneurs with mentoring and networks, particularly with investors, fellow entrepreneurs and incumbent businesses that are increasingly open to them through their corporate venturing units.

The flowering of these corporate and university venturing funds brings hope the niche market will widen and become more fruitful. Governments increasingly recognise the impact that equity can play in supporting people with innovative ideas, as long as it is on a level playing field with debt. The unique data, insights and analysis in this report bring to light the conditions required for imaginative ideas and capital to come together.

But perhaps the greatest requirement is for the collaboration to come between the ideas capitals themselves. Here, too, we are seeing a flowering of mutually-beneficial interests coming together from different institutions and regions. But while technology can make it easier to communicate over distance, the cultural or moral challenge remains. Beyond capital and technology, the leaders of the next generation will also have to tackle this challenge.

In addition to his role with Global University Venturing, Shelley Harrison is senior adviser and head of corporate portfolio ventures at Coller Capital, a global investor in private equity secondaries with more than $13.5bn under management. He serves as NYU applied scientist, entrepreneur and inaugural executive-in-residence for the NYU Cenre for Urban Sciences & Progress (CUSP)

Methodology

By James Mawson, editor-in-chief, Global University Venturing, Global Corporate Venturing and Global Government Venturing

Hypothesis: The more innovative corporations will want to work with the more entrepreneurial-minded universities and public research centres to access the ideas, employees and spin-outs/startups they can use.

Global Corporate Venturing used its proprietary ranking of corporate venturing units as a proxy for the innovation status of 1,000 large businesses across sectors and regions. Its survey asked more than 110 of these corporations to provide their qualitative perspective on whether they looked to universities for help when looking for early-stage ideas and investments.

Global University Venturing in turn asked 50 groups from its audience of the top 350 universities and public research labs what insights and quantative data they could share to show numbers of spin-outs, student startups, support post-institution, research commercialisation, such as licensing fees, where students work after graduating and their societal impact to the region. Global Corporate Venturing complemented this perspective with its unique database of corporate investment in early-stage companies to analyse any trends in the university entrepreneurs that are being backed.

The survey respondents included the most influential and innovative institutions from around the world, including 20% of the most important universities from the Global University Venturing VIP list and 22% of the top 100 most influential people from the Global Corporate Venturing Powerlist.

Out of this survey and data, and the years of research refined through the magazines themselves, have come some best practices for universities and research labs in engaging their entrepreneurial community and incumbent corporations that can aid them as part of their own open innovation best practices at the early stage.

We thank the editors of Global University Venturing and Global Corporate Venturing, Gregg Bayes-Brown and Toby Lewis, respectively, and their teams, including Thierry Heles, Amy King and Kaloyan Andonov, and we are grateful for the support of the European Commission through Erik Vermeulen at Tilburg University, Russian Venture Company and Kauffman Fellows, through John McIntyre in particular, as well as contributors of articles, data and survey insights in the list of acknowledgements.

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Introduction

By James Mawson, editor-in-chief

It has become a low-growth world of negative interest rates, creating demand for assets that can yield relatively higher returns. Excluding potential geopolitical shocks that could undermine recent assumptions, globalisation allows capital, ideas and people to flow across borders more easily, while technology is creating a virtual network and ecosystem and sources of disruption to incumbents and these higher-returning assets.

Both broad trends encourage people to look for competitive advantage through understanding and utilising innovation that can shape our future and capture the value from these changes. Ideas are the starting point for innovation but change requires ideas to be turned into action. This requires capital and knowledge – and, increasingly, collaboration, as the introduction to last year's paper for the European Commission, The Emergence of Collaborative Funding Models and Platforms, indicates *(see page 84)*.

Innovation capital distribution skewed potentially affecting entrepreneurial capacities

Less than half of corporations engage with universities at the early stage but could gain a competitive advantage

Gap between expectations for early-stage investments narrowing with best practices on collaboration

Looking at the sources of innovation capital in the US and Europe *(see table)*, it is immediately clear that the latter has a third more money trying to support this activity than America's $940.2bn in 2013.

Though correlation and causality are notoriously hard to distinguish, this raises the question of whether the level of capital is as important as the behaviour sparked by the form of the capital.

More than two-thirds, $832.3bn, of Europe's innovation capital in 2013 came from loans, compared with about a third ($318.2bn) in the US. Thus, the US had $622bn in research and development (R&D) and equity-like investments, compared with Europe's estimated $420.3bn.

Governments both reflect a country's culture and also help shape its entrepreneurial endeavours through the rules, policies and ambitions for their peoples and for small and medium-sized enterprises

Sources of innovation capital in 2013

Capital type	US ($bn)	Europe ($bn)
1 Loans	312.6	792.2
2 Corporate R&D*	214.2	179.6
3 Family and friends**	207	93.5
4 Public R&D	115	57***
5 Venture	33.1	7.4
6 Government guarantees and sponsored loans	30	73.4
7 Crowd****	9.5	3.3
8 Angel	19.2	6.1
9 Securitised loans	5.6	40.1
Total	**940.2**	**1,252.6**

* Taken from the 2014 EU Industrial R&D Investment Scoreboard based on a sample of 2,500 companies and equivalent to about 90% of the total expenditure on R&D by businesses worldwide
** US family and friends' contribution assumed at 18% (SBA) of all borrowing. EU, 5% of funding from family or friends (EC) (2013)
*** EU 20
**** 2014 data
Sources: 1, 3, 6, 9 Boston Consulting Group; 2 European Commission; 4 National Science Foundation Higher Education Research and Development Survey; 5 Ernst & Young using Dow Jones Venturesource; 7 Massolution's Crowdfunding Industry Report; 8 EBAN; 9 Organisation for Economic Co-operation and Development; Analysis by Global Corporate Venturing

The genesis of entrepreneurial ideas is often triggered from work at a university or research institute, or from seeing unmet market needs at an existing corporation or startup

(SMEs). As Chrystia Freeland, a member of the Canadian parliament, wrote in the magazine Atlantic: "Successful businesses will be the ones that recognise a truism that should have been obvious from the start – business and politics are in fact inseparable, and the latter makes greater economic integration less certain than business leaders might wish."

Encouraging debt over equity investments through tax-deductibility of interest is perhaps counter-intuitive for society if the shareholders rather than bankers improve entrepreneurial governance and growth rates. Creating new stock might be more use than boosting the value of existing assets that might become redundant before depreciation or amortisation is fully accounted for.

In the European Commission's (EC's) 2013 SMEs' Access to Finance survey, 75% of EU SMEs had used at least one form of debt financing, excluding debt securities and equity, in the previous six months, unchanged from 2011 levels. Equity financing was little used, by just 5% of EU SMEs in the previous six months, which was slightly lower than the 2011 level of 7%, and most likely to be used by SMEs with a stock market listing (17%), by the largest SMEs (10% of those with a turnover exceeding €50m) and by 9% of gazelles (SMEs less than five years old which have grown at over 20% a year).

This is why the EC has placed such emphasis on growing equity investment rates as it prepares the ground for a capital markets union for its 28 member states later this decade. As Jean-Claude Juncker, president of the EC, said in his Political Guidelines for the Next Commission: "To improve the financing of our economy, we should further develop and integrate capital markets. This would cut the cost of raising capital, notably for SMEs, and help reduce our very high dependence on bank funding."

Jean-Claude Juncker: "We should further develop and integrate capital markets"

Having family, friends, professional venture and angel investors and people in the crowd willing to support an idea might count for more than the aggregate dollars invested if they are looking for the ideas and teams that can both start and scale up an entrepreneurial initiative into a world champion.

But ideas and teams need to come from somewhere. And here the role of R&D from corporate and public sources is an important spring. According to the Organisation for Economic Co-operation and Development's (OECD's) latest biennial report: "In the decade since 2002, the growth of the science base in the US and the EU has been driven by universities, which have seen a robust increase in their expenditures.

"Over time, there has also been a shift towards university-based research across the OECD. In China, the growth of scientific activity has been driven by public research institutes, in particular by large investments by the Chinese Academy of Sciences."

While plenty of breakthrough ideas and companies are started in a garage – notably the technology firm created by William Hewlett and David Packard – the genesis of entrepreneurial ideas is often triggered from work at a university or research institute, or from seeing unmet market needs at an existing corporation or startup *(see box overleaf)*.

Hewlett and Packard were encouraged to set up a business by their Stanford engineering professor, Frederick Terman, who in the 1930s envisaged startups and technology as a way of bringing added-

value industries and jobs to California rather than having to export natural resources to the east coast of the US.

So while the entrepreneurial ecosystem itself is broader than the roles provided by corporations and universities, given the importance of these two pillars of innovation capital to developing ideas into commercial and societal success, continuing to refine and improve their links and results will benefit the world.

Understandably, therefore, governments are playing an active role in fostering the early-stage ecosystem through convening links, setting definitions *(see box opposite)*, regulatory and tax frameworks and as a source of capital, academics Martin Haemmig and Boris Battistini found in their review on page 78.

The article on best practices by Global University Venturing editor Gregg Bayes-Brown sketches out the roadmap for the way forward. Universities and public research institutes (PRIs) are increasingly pressured by government performance reviews to want to work with business as a way of developing financial returns and societal impact from their education and research. However, fewer than half the corporations appear to feel the same way.

From a survey of 114 corporations, 48.1% of respondents said they looked to universities and business schools for portfolio companies, with 37.7% looking for spin-outs from universities, according to Toby Lewis, editor of Global Corporate Venturing. A related survey on page 34 of nearly 50 top universities showed three-quarters of respondents spin out fewer than 10 startups a year.

For the spin-outs that do receive backing, corporations are often a vital supply of capital and support beyond that offered by specialist venture capital firms, angels and their own academic institutions.

That so few corporations look to universities and PRIs, such as the European Organisation for Nuclear Research (Cern), gives a competitive advantage to those that do, albeit one that can bring an expectations gap, as our interviews to support the survey show on page 58. The leading academic, corporate and government groups are the ones thinking innovatively about how and why they can work together.

Corporations, such as search engine provider Google and chip maker Intel's corporate venturing units, can back multiple university spin-outs each year, according to our analysis of Global University

Sources of entrepreneurs

In March last year, data provider Mattermark published research of more than 1.5 million professionals connected to technology startups to try to identify patterns of prospective entrepreneurs by their education, previous employers, seniority level, role within a company, geography and age.

From its analysis:

- 15% of venture-backed founders have a computer science degree but management consultants are more than two-times more likely to be venture-backed founders than engineers.
- 38% of venture-backed founders are over 40 years old.
- 43% of venture backed founders worked at a venture-backed company immediately before founding.
- Two-thirds of venture-backed founders were not in a senior leadership position prior to founding.
- Contrary to conventional wisdom, being stuck in the same company or position for a long time – even a decade – does not diminish your likelihood of becoming a founder.

The research helped identify 350 people – its "Future Founders" – to be invited by corporate venturing unit Bloomberg Beta, funded by the media company, to begin a programme to connect them to each other and explore starting a company.

The most predictive group of future founders to Mattermark were Stanford graduates with computer sciences degrees who are currently working at, but are not founders of, a venture-backed startup.

Based on the sample population related to the startup ecosystem that Mattermark included in its study, an individual in this group has a 0.66% chance of starting a company. The Future Founders group has a 17% chance, and Roy Bahat, head of Bloomberg Beta, said one, Ryan Hoover, had already been venture funded, although other results were unavailable. Mattermark was unavailable for comment.

Gathering hard data in a rapidly-developing area is complicated given most universities in our survey failed publicly to track student startup and entrepreneurial work numbers

Venturing's database on page 40, although the majority that are interested in student and faculty as sources of entrepreneurial ideas are less active.

These corporate venturing deals, also as part of a corporate-backed accelerator or incubator, are part of a toolkit used by the most innovative businesses as they seek to exploit any source of competitive advantage through open innovation as well as other tools, such as mergers and acquisitions, joint ventures, licensing and internal research and development, according to the rest of the survey on page 52. Corporations have been partly behind the explosion of accelerators to more than 2,000 over the decade to last year, many of which are sited in or near the main universities and cities to attract people to join cohorts going through the programmes.

But gathering hard data in a rapidly-developing area is complicated given most universities in our survey failed publicly to track student startup and entrepreneurial work numbers.

John McIntyre, managing director of computer networking company Citrix's Startup Accelerator, through his association with the US training agency Kauffman Fellows has partnered Global Corporate Venturing and Massachusetts Institute of Technology entrepreneurship professor Yael Hochberg to conduct this survey, which will begin to track and answer questions around the effectiveness of accelerator-style programmes and corporate innovation, according to his guest comment on page 69.

Through his work at Tilburg University, Erik Vermeulen is separately running a project on investor readiness to analyse this report and other early-stage and venture data for the European Commission.

Other regions, such as Russia, China, Singapore, Japan and Brazil, are also exploring how their corporations, universities and societies can be ready for innovation. This means starting at the earliest stage.

How SMEs are defined

Management consultant Boston Consulting Group published its guide to small and medium-sized enterprises and included the differences between Europe and the US.

Standard European definition, according to EU law

Micro enterprises: employing fewer than 10 people, with an annual turnover not exceeding €2m, or a balance sheet total not exceeding €2m.

Small enterprises: larger than micro firms, but employing fewer than 50 people, with annual turnover not exceeding €10m.

Medium-sized enterprises: firms larger than small enterprises, but employing fewer than 250 people, with annual turnover not exceeding €50m.

Mifid II definition: SMEs are defined for the purposes of Mifid II as companies that had an average market capitalisation of less than €200m on the basis of end-year quotes for the previous three calendar years. As the European Securities and Markets Authority points out, this could be interpreted as excluding all SMEs with a lifespan of less than three years from counting towards the 50% threshold.

US Small Business Administration definition

The Small Business Administration (SBA) defines a small business concern as one that is independently owned and operated, organised for profit, and not dominant in its field. Depending on the industry, size standard eligibility is based on the average number of employees for the preceding 12 months, or on sales volume averaged over a three-year period.

Examples of SBA general size standards include:

- Manufacturing: maximum number of employees may range from 500 to 1,500, depending on product manufactured.
- Wholesaling: maximum number of employees may range from 100 to 500, depending on product being provided.
- Services: annual receipts may not exceed $2.5m to $21.5m, depending on service being provided.
- Retailing: annual receipts may not exceed $5m to $21m, depending on the product being provided.
- General and heavy construction: general construction annual receipts may not exceed $13.5m to $17m, depending on the type of construction.
- Special trade construction: annual receipts may not exceed $7m
- Agriculture: annual receipts may not exceed $0.5m to $9m, depending on the type of agricultural product.

Source: Bridging the Growth Gap, March 2015

Universities' early stage best practices

By Gregg Bayes-Brown,
editor, Global University Venturing

From technology transfer and incubators to providing both the talent and the very breeding ground an idea itself, the university's role in creating early-stage opportunities is important in terms of what it can offer and in how it supports the wider ecosystem.

There is an increasing necessity for universities to be pivotal centres in the economy, at a local, national, and international level as institutions look to leverage their talent and knowledge. However, to understand how to harness universities, a corporate, government, or investor must first understand the university mission, which takes precedence over other drivers such as profit margins or gross domestic product.

Simply put, a university's bottom line is education. While research supports this mission, it is the calibre of students and the funding they can bring to the university which ensures great research can continue. It is part of a circle, where strong education attracts the best students which, along with government and corporate cash and returns from venture and other investments, help fund higher levels of research that attracts a higher calibre of researcher and lecturer which drives prestige, in turn feeding back into a better academic reputation and education and more funding.

In terms of early stage, students create a talent pool, which both the university community and prospective employers can pull from, and, increasingly, are generating a higher number of startups.

Critical mass: At every part of the university innovation cycle, a university needs to consider whether there is substantial momentum behind an idea, project, or initiative to succeed

Collaboration: In order to create this mass, smaller universities need to collaborate on the innovation level

Industry-university relations: The other form of collaboration universities need to work on is building the bridge between academia and the corporate world through discussing what issues both have, and resolving those issues

Harnessing the student body: Students want value for the time and money they put into studying through hands-on experience, opportunities to well-paid jobs and, increasingly, it means the chance to explore the entrepreneurial side

Innovation programmes have been established to translate the taxpayer-funded research into something tangible by licensing out the intellectual property (IP) to existing companies, or creating new spin-outs, and supporting entrepreneurship across the campus with initiatives such as funding competitions and incubators to give fresh companies a boost. Furthermore, more universities are moving into an investment role, both through direct grants and investments, and also as a magnet to attract further investment.

It is, however, not a one-size-fits-all model. What works for the UK's Cambridge University will sometimes be different than the best model for Finland's Aalto University. Locations matter, as does the

resources a university has at its disposal. And despite every university's drive to achieve recognition, in a world with around 60,000 or so institutions, not every one of them is going to make it to the ranking tables.

What universities can strive to do is increase their interconnectivity with their surrounding ecosystems, to forge stronger and more robust relations with corporates, and harness best practice where possible to collaborate both on campus and beyond on a well-developed early-stage model that can be scaled up over time for the benefit of everyone.

The impact of the student body

When it comes to the future of a university, its students are representative. These are the people who will go on to become academics at that university or others, generate startups that every university hopes will be the next social network Facebook, and enter companies, hopefully enhancing a university's prestige with their work.

In what could probably be described as the Mark Zuckerberg effect – after the co-founder of Facebook at Harvard University and who took the company to a record-breaking flotation – the millennial generation currently passing through student halls are regarded as more entrepreneurially-minded than any preceding generation.

Spain-based bank Santander found that nearly a quarter of students in the UK have set up a side business while studying, which the bank estimated generated a collective turnover of $67m, while UK social entrepreneurship charity UnLtd found that 55% of 16 to 25-year-olds wanted to launch a startup.

There are a number of reasons for this, including tuition fees and low expectation of future employment prospects and remuneration. Countries such as France and Germany are keeping their student fees relatively low compared with the top-ranked institutions in the US and UK.

In the US, the average annual cost of attending a private university is $42,419, according to the US College Board for the academic year 2014-15. In the UK – but not Scotland where tuition is still free – tuition fees have trebled in the past five years to $13,700 a year.

Following graduation, students in Europe and the US are expected to find a jobs market showing no real growth in the sort of middle class jobs to which they traditionally aspired and where incomes in these roles have been falling over 20 years.

The middle class in Europe and the US is expected to show zero growth over the period from 2009 to 2030, at just more than a billion people in aggregate, with almost all the global growth in the middle class concentrated in the six-fold increase to 3.2 billion middle-class people in Asia-Pacific, especially in India and China, according to research by Homi Kharas and Geoffrey Gertz in their paper, The new global middle class, referenced in the May issue of Atlantic magazine.

From 1988 to 2008, middle-class incomes increased in emerging markets and fell in industrialised nations, according to research by Christoph Lakner and Branko Milanovic in their paper, Global income distribution from the fall of the Berlin Wall to the Great Recession, for the World Bank.

These two factors, along with perceived cultural changes among the most recent cohorts of graduates, is increasing demand for more entrepreneurship programmes. In Canada, which is going through what Martin Croteau, director of academic entrepreneurship at the Ontario Centres of Excellence, described as a "golden age" for technology transfer and entrepreneurship, students are driving the movement towards company generation.

He added: "Back in the heyday of the dot.com boom [around 2000], if you were caught on our

campuses even whispering the idea of a startup company to a researcher, faculty staff or students, and the dean of the department caught you, he would pick you up by the scruff of your neck and throw you out the building."

That has now changed. Croteau said: "There has been a revolution over the past 15 years, and the last five in particular.

"If you ased the universities why that has occurred, they would tell you that they were doing it in response to their faculty members looking to develop IP, and students looking at entrepreneurship as a career option. This group of millennials has the world by the tail."

But looking into the data in many regions shows a more mixed picture. The Organisation for Economic Co-operation and Development's (OECD's) Science, Technology and Industry Outlook 2014 research on the commercialisation of public research found average annual growth of university patent applications fell from 11.8% between 2001 and 2005 to 1.3% between 2006 and 2010, while public research institutes (PRIs) showed negative growth of –1.3% over the latter period compared with growth of 5.3% between 2001 and 2005.

Licensing income remained relatively stable in OECD countries, although a few universities account for the bulk. In Europe, 10% of universities accounted for about 85% of licensing income, according to OECD research in 2013 for the Outlook report.

The OECD said disclosure of inventions per $100m of research expenditure showed a slight average drop from the 2004-07 to the 2008-11 periods and university spin-offs had failed to expand significantly in number despite continued policy support. In the US, among 157 universities, there is an average of four annual spin-offs per university.

The OECD said: "While the situation may be due in part to the changing ecology of innovation, such as the fact that modern technological innovations are complex and rely on several patents, the slow adjustment of institutional and public policies have also played a role.

"Many governments and institutions have focused excessively on patenting and licensing as a channel for commercialisation. This has led to a rise in the number of patents filed and a narrow emphasis on exclusive licensing of inventions. Many institutions have also focused on the role of professors in commercialisation and less on student entrepreneurs.

"Governments, universities and PRIs are now experimenting with new strategies to improve the commercialisation of public research, [such as public-private partnerships, joint research initiatives and centres, outward and inward licensing of IP by universities and PRIs and incentives for the mobility of entrepreneurial academics]."

A Canadian university leading the world in responding to this challenge from students is Waterloo. The engineering-focused institution has become a magnet for students and entrepreneurially-minded professors, and threads a drive towards innovation from undergraduate courses all the way up the academic food chain. Waterloo runs one of the largest co-operative education programmes in the world, in which last year 19,000 students participated in paid roles at 5,000 companies, including international firms, collectively earning them $190,000.

This experience both sets students up for the demands of corporate life on graduation, and also gives them insight into how to run their own businesses. Alongside WatCo, Waterloo's tech transfer office, the university has three other branches to support entrepreneurship.

It runs a centre to develop ideas generated by students on its master of business, entrepreneurship and technology (MBET) course, from which 45% of its students emerge with experience in leading

a startup. The course is structured purely around launching startups, as opposed to a traditional master of business administration (MBA), offered by numerous universities, which is angled towards management of an established firm, and provides mentoring and access to funding, as well as developing skillsets for starting a business.

The university also runs a public-facing incubator, the Accelerator Centre, which works with the local economy to develop and support ideas coming out of the locale. To date, it has led to the creation of 1,055 businesses and they have raised $157m of external funding.

Perhaps the best-known part of Waterloo's efforts to support student entrepreneurship is the Velocity incubator. In a similar model cropping up across the country and elsewhere, it is a university-owned incubator tasked with supporting student startups. Since opening its doors in 2008, Velocity has brought together teams of students and recent graduates across different subject areas to develop business ideas alongside their studies, as well as running biannual pitch competitions where four or five student groups win $25,000 to seed their ventures, along with free working space and mentoring. Velocity has overseen the creation of 63 companies and 341 jobs, and its startups have secured $90m in external investment.

Others are following this lead. Kendrick White, vice-rector of innovation at Russia-based Lobachevsky State University of Nizhni Novgorod (UNN), said it had been overhauling its innovation practices. He said: "Previously, our university, as most in Russia, had only a very weak internal capacity for tech transfer, which began with the identification of new discoveries, but then practically ended with the filing of a simple Russian patent.

"Our university had never previously developed any serious licensing agreements or went so far as to secure international patents on our discoveries, and most of the spin-outs formed by the university were only designed to secure short-term grant funding from the FASIE [the Russian government's Foundation for Assistance to Small Innovative Enterprises] fund, but rarely ever developed living spin-outs which could hope to attract private sector funding.

"We have [now] moved to completely overhaul the commercialisation infrastructure here [at UNN], based on the best practices of MIT [Massachusetts Institute of Technology], University of Maryland, Purdue and other such successful [US] institutions.

"Today, there is a growing awareness of what the missing elements are within university tech transfer departments. It is necessary to establish within the university ecosystem a proof-of-concept centre staffed with professionals in tech commercialisation, VC [venture capital], tech brokerage and management consulting. Budgets must be allocated to pay the required market-based salaries for such professionals.

"Part of the solution has been [for UNN] to become a founding member of the International Proof of Concept Association (IPOCA), together with MIT, Skoltech, ITMO and Masdar.

"The idea is to set up a global collaborative network of like-minded business people running the technology commercialisation centres at various US and Russian universities, which have a common goal of creating products. I can see a global trend in this effort and feel that both corporate and private-sector angels and VCs will be very interested to align with this effort.

"On a third front, I am forming an alliance with the global association of Russian-speaking scientists, the Russian-American Scientists Association, which will form the backbone of an international network of Russian diaspora science and commercialisation expert mentors that IPOCA can tap into to help develop market entry strategies for Russian technologies into the US, EU, Israel and Asian markets.

"Additionally, it is now becoming quite clear that additional funding should be allocated by the federal

and local governments for translational research. Funds are urgently needed, as there are few real business angel investors in Russia willing to support early-stage, high-tech startups.

"The FASIE fund is working in this direction but the effect has not been noticeable due to the lack of local professionals at the local university level which could be counted upon to support the project directly in their efforts.

"These funds should be managed by the professional tech commercialisation and proof-of-concept teams to be located inside each university and should not be attempted to be managed by Moscow managers [based] far away."

Translating research

The second pillar of the university mission, that of research, also helps the early-stage ecosystem. Not all universities conduct research, but those that do have a significant impact on a number of sectors. Life sciences tend to receive the lion's share of attention from universities, but IT, computing hardware, communications, engineering, agriculture, clean-tech, oil and gas, transport, aviation, space, big data, advanced materials, defence, robotics, nanotechnology and numerous other high-tech areas all draw heavily from university-led research.

The majority of research is still conducted through government grants or money coming from the university itself. Often, it is not known at the start that the end product will work, or what that end product actually is useful for, or if there even will be an end product once an academic paper is published.

This leads to a pile of potential ideas stacking up in any university with a half-decent research base. The question then becomes what to do with them. More often than not, potential inventions will be submitted to a technology transfer office (TTO) which will then assess the idea for market potential, choose whether or not to pursue a patent, and then decide whether the best option is to license the technology to an existing firm, spin out the IP into a new company, or seek other technologies at other universities which could combine with the IP to generate a bigger, better product.

Spin-out companies

While many US universities will label academic spin-outs as startups, it is worth differentiating between the two.

First, unlike a regular startup or those of a student origin, the IP driving a spin-out means that the parent university will have a stake in that company. Most of the time, this means an equity position, as the university will have had to put up costs to have the IP patented, paid for the due diligence of its technology transfer team and, of course, led the research in the first place. However, some universities, such as MIT, choose to forego their equity stake yet are still intrinsically tied to the success of that company as the research driving it, and often members of either the board or the executives running the company, originate from the university, meaning the reputation of the university is on the line.

That stake could also be crucially important to universities should the company achieve corporate success. Last year's sale of NaturalMotion, a computer games animation software spin-out of Oxford University's zoology department, to gaming firm Zynga for $527m made a return of $50m for its parent university. That money can then be reinvested in tech transfer operations, wider innovation strategies across the campus, attracting more PhDs and professors, or developing new facilities for faculties to produce more research.

Spin-outs tend to be more stable than their startup peers, according to empirical studies, including

Getting a concept from lab idea with a patent to a functional company often requires a leap of faith on behalf of those running the company, the university, investors and potential customers

one by Uwe Cantner and Maximilian Göthner on 128 academic spin-outs in Germany, which reveals a higher percentage making it past the three-year survival point, although this can waver dependent on sector, university and location. There can also be mergers and acquisitions as big corporations which start as customers or investors at the early stage see the technology develop to a point where it is worth incorporating into the larger firm.

However, spin-outs are not without problems. Getting a concept from lab idea with a patent to a functional company often requires a leap of faith on behalf of those running the company, the university, investors and potential customers. Often the technology backing spin-outs is unproven, and will require further development inside the spin-out before it is market ready. Getting from concept to functioning business is often called crossing the "valley of death", where a lack of funding from risk-averse universities and investors means new drugs or inventions can disappear before they have even had a chance to shine.

There is also the issue of building the spin-out team. Academics develop a strong connection to the technology they develop, but there can be better, possibly external, management candidates to lead spin-outs. While there are those that break the mould – such as Michael Lynch, who headed Cambridge spin-out Autonomy and led the company to be one of two Cambridge firms valued at over $10bn – the thinking is that an academic is best at the science, not running the business.

Therefore, an academic is generally advised to take an advisory role that can build into a bigger part, such as chief technology officer, as they develop the business skillset. But to get off the ground, it is advised that spin-outs look to bring in experienced CEOs or executives who have worked with similar technology in the past to give the company that initial push off the ground, while seeking a board that can advise through the formative stages.

This is also a crucial step in securing funding to build the spin-out. Considering how early-stage some spin-outs are – with some even proposing entirely new markets – investors need to see a safe pair of hands at the helm – someone who can sit on the bridge between academia and industry.

Licensing

The main alternative to spin-outs is licensing technology from the university to an existing entity.

When a licensing deal is struck, universities will be entitled to regular royalty payments which can run over a set period according to the deal made, or the length of the patent supporting the licensing deal. When the right technology and the right partner are combined, a licensing deal can prove lucrative to the university. There are fewer upfront costs and heavy lifting than with constructing spin-outs. However, universities lose out on any rewards a spin-out can bring, such as an equity stake in the company or being a direct influence on creating jobs in its locale, although a company may well choose to increase its headcount to make best use of the IP.

The general split for royalties is variable dependent on the university, but a guideline is a three-way split on royalties between the inventor, the faculty and the university.

So when is pursuing a licence considered over a spin-out? Drawing on advice provided by Imperial Innovations, the technology transfer arm of Imperial College London, we can see that there are a range of factors that play into a TTO's decision to go down one path over the other.

Broadly, Imperial splits these into IP, inventor, market opportunity versus investment required, resources, technology, availability of prospective licensees, control and influence, economics and business case. When considering the IP, licensing is the best route for anything with a narrow IP position, where there is only one obvious licensee and little significant post-licence support required, while a spin-out is the best option when there is freedom to operate, new IP could be generated, and

a suite of patents and know-how exists.

The inventor is also a consideration. If the IP is outside the mainstream of that professor's research or there is pressure to generate cash up front, then a licence will be pursued, whereas a spin-out is considered when the inventor can remain involved or is willing to take a long-term view and defer short-term rewards.

A small or unattractive marketplace, or one where the IP represents only a slight improvement on what is available, would sway towards licence, whereas an area that can attract future investment and a technology that can justify high risk would lean towards a spin-out. There is also the question of whether a TTO can build a team that will inspire confidence as a spin-out, otherwise licensing might be the way forward.

The technology itself is also a sticking point. If it is only half ready and lacks data, securing a licensee might prove tricky, or if it is fully formed and value can be drawn from it then a spin-out may be the best option. Also, if licensees cannot be identified yet there is certain value in the proposition, a spin-out may be the best course of action. The aforementioned prestige and branding can come into the decision, whereby technology over which a university wants to assert continuing influence can lead to a spin-out. And finally, economics comes into play. Is there a business case to be made, and which route is going to generate a greater return for the university?

One of the other hurdles licences need to overcome is pairing up with the right company. While TTOs will pursue potential partnerships, multiple single entities chasing individual companies can prove ineffective, especially for smaller universities. To this end, there are now numerous portals, but generally through member organisations or behind paywalls.

Collaboration

Getting the most out of technology stemming from universities can often yield greater results when universities work with other institutions or corporations.

There is currently a three-year collaboration between Germany's Fraunhofer Institute and New Zealand's Auckland University to develop an exoskeletal arm which could lead to the creation of a light-weight, low-cost exoskeleton for lifting heavy objects, both in a home and an industrial setting, as well as in physiotherapy.

The project is working with previously spun-out technology, and merging it. Two Auckland innovations, muscle movement detection device StretchSense and inertial sensor IMeasureU, will be used by Auckland scientists to design the arm, and Fraunhofer will take over on the physical prototype and product.

Another beacon is the Skolkovo innovation centre project in Russia. Skolkovo is looking to capitalise on Russia's research base to bolster its output in areas such as space, energy science and technology. It is drawing on corporate partnerships with Microsoft and Intel, academic partnerships with Cambridge and Harvard, $4.2bn from the Russian state, and a partnership with MIT that has led to the institute establishing a campus called SkolTech to bring MIT know-how to Moscow. It also recently secured a $200m university venturing fund supported by Chinese venture capitalist Cybernaut.

It is this sort of international co-operation that Israel's Tel Aviv University and China's Tsinghua University are attempting to capture with the recent launch of the Xin Centre for Innovative Research and Education. Meaning "new" or "heart" in Chinese, the Xin centre will focus on nanotechnology before expanding into other fields, and will draw on leading researchers from Israel and China.

Tel Aviv is no stranger to fostering these strong links, and has wooed India-based Tata Industries and

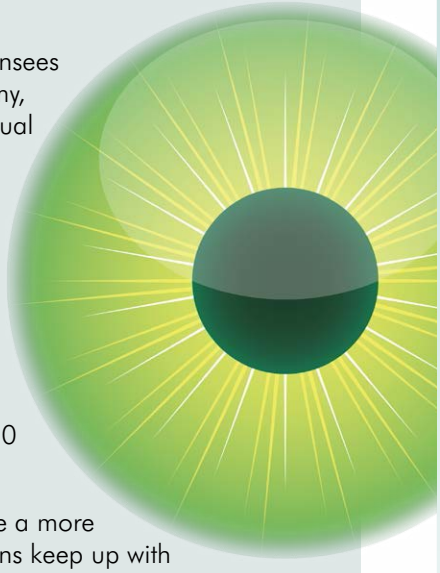
Intellectual property portals

There can sometimes seem more early-stage ideas than money, which creates a selection problem – how to sift through and find the right ones – and a host of platforms trying to help.

Tim Bernstein, partner at US-based firm Yet2's commercialisation fund, said: "It is our sense that our most innovative corporate and CVC [corporate venture capital] clients find much more value in being able to scan broadly across universities. It is actually our less innovative corporates and CVCs that we see still locking in deeper relationships with only a few universities.

"Though there may be some nice initial wins with specific universities, usually the corporate partner quickly exhausts much of the relevant value that any one university has to offer."

Easy Access IP is one offering an open opportunity mechanism to allow companies and individuals free access to these technologies so new products and services can be developed that will benefit society and the economy.



In return for free access to the research and IP, the portal asks its licensees to demonstrate how they will create value for society and the economy, acknowledge the licensing institution as the originator of the intellectual property, report annually on the progress, agree that if the IP is not exploited within three years the licence will be revoked and agree that there will be no limitations on the licensees use of the IP for the university's own research.

Others are looking to use the pricing mechanism. Scott Sharp, CEO of Leading Edge Only, said its platform was the "LinkedIn for innovation" as companies and universities put up profiles of innovations so that others looking for solutions can contact them. Launched last year, Leading Edge Only has had 60,000 views and 20 universities on the platform.

Peter Holden, founder of IPCreate, said his company was trying to be a more proactive portal to provide "invention on demand to help corporations keep up with disruption".

He added: "Startups lack the resources to file for patents and we want to be an IP support rather than tax on it."

VJ Anma, co-founder and CEO of IdeaMarket, said its platform helps identify a problem and then invites the crowd to solve it.

He added that Ideamarket was trying a new business model to help entrepreneurs. Ideamarket will help those coming up with the IP set up a business rather than just sign over the rights to the client. Ideamarket will then own part of the startup, about 5%.

Since September, IdeaMarket has had 43 ideas with $5.4m of aggregate money funding them and the first four matches made.

Anma added: "We are putting in place the legal framework for the three stages – brainstorm a challenge, form a company that solves the challenge, help the company after formation.

"Our backers are angels – Bill Gross, Steve Case, Peter Diamandis – and we could be a platform for their challenges, for example Startup America."

Singularity University's different breeding

Singularity University could be regarded as a virtual education organisation run on a shoe-string from a low-rise pre-fab building on a dusty air base. Despite its name, it is not a university, has no formal accreditation, but instead is set up as a California benefit corporation – a hybrid legal entity allowing an organisation to pursue profit as well as, in the case of Singularity University, "the creation of material positive impact on society and the environment".

It is, as David Hite, co-founder of venture capital firm Bridge 37, said: "Much more a startup than a university."

Singularity University existed as a non-government organisation until 2012 and converted to benefit corporation status shortly after the creation of that legal vehicle.

Its students arrive at the Nasa Ames Research Centre in Mountain View, California, from around the world, and stay in a low-rise accommodation block on the airfield while they explore venture ideas that could affect markets of at least a billion people.

It is, as Hite said, an "obvious contrast with super-established universities that pursue super-traditional models of tech transfer and are sincerely dedicated to the creation of value and wealth by bridging academic research into commercialisation".

The Singularity University (SU) model has already provided for the creation or enablement of 30 "SU companies", the top five of which raised about $100m in 2014, and it is just launching a formal accelerator programme to develop the companies leveraging the education and advancement of exponentially growing technologies.

Companies in the accelerator will be a mix of those that apply to the accelerator, having been founded outside and having no connection with Singularity University, and companies that spring from Singularity University's own programmes, Hite said, with Bridge 37 able to back the graduates from the cohorts.

memory storage firm SanDisk into backing its $23.5m Technology Innovation Momentum Fund, securing not only corporate cash to bolster its early-stage projects but clear routes to market for the technology that will emerge.

These corporate partnerships can lead to big things for university companies. The relationship between Samsung and Technical University of Dresden spin-out Novaled, which is producing organic light-emitting diodes (OLEDs), is an example of how a corporate partner can help a spin-out grow while gaining an edge over its competitors by harnessing the spin-out's technology.

Spun out in 2001, Novaled's technology was ahead of its time, and it floundered for some time as the world caught up. When it did, Samsung saw the potential. The majority of Novaled's OLED sales went to Samsung, which the corporation has integrated into its products, most recently in its Samsung Galaxy S6 Edge, which allows the phone's screen to curve at the edges. On top of the sales, Novaled also received funding from Samsung, which acquired a 10% stake in the firm in 2011. It then capitalised on this in 2013 in an acquisition worth $345m.

In some cases, the tech transfer office will be bundled up with other programmes to create one innovation offering. This gives both the university and outside organisations a one-stop shop

Models of technology transfer

Technology transfer office (TTO) can be a broad term but its operation is complex, and models seem to vary from country to country and university to university.

The office

The most basic, and most commonly seen, version of a TTO is a two-person office, often at mid-level research universities, which tend to be understaffed and undertrained, mostly invisible to the untrained eye, is likely to be operating in the red and operating outside core sections of the university. Typically, it will not have a fund of any kind to speak of, or any incubator or mentoring services to offer.

Key points
- Easy to set up
- Ineffective at translating technology
- Tends to rack up more costs than profits

The integrated office

Often bigger than an office is a department that has been threaded into the wider research offering of a university. Occasionally, responsibilities will be divided between similar offices, such as corporate relations, outreach or liaison offices and technology licensing offices that are sometimes the same as TTOs, sometimes not. This tends to be a much more stable model of tech transfer, and our top-ranked TTO in the world, MIT's technology licensing office, follows this model. Often, directors or managing directors will report directly to the vice-president or equivalent of research and, in some cases, they are one and the same. This gives an office that has been properly integrated into a university's research ecosystem a lot more sway in the university, allowing it to tap into the research better and access the resources necessary to conduct business effectively.

Key points
- Can funnel resources into tech transfer
- Often is a key stakeholder at the research table
- Is not independent
- Cannot operate outside the boundaries set by its university

The innovation arm

In some cases, such as University College London (UCL) Enterprise, the tech transfer office will be bundled up with other programmes to create one innovation offering. This differs from the integrated office as it operates separately from the research side of an office, and gives both the university and outside organisations a one-stop shop. In UCL Enterprise's case, the office has a vice-provost, has a funding arm, manages the TTO, looks after student ventures, provides staff training and business support, provides a consultancy arm, arranges its own partnerships, and conducts all its communications from the same umbrella.

Key points
- Provides all innovation services as one cohesive unit
- Is built with business, international and collaborative outreach in mind
- Looks after innovation strategy as a whole, not just tech transfer

The wholly-owned business

The wholly-owned technology transfer business, such as Oxford University's Isis Innovation, affords a degree of autonomy from the parent university that can allow it to pursue commercialisation

strategies more freely than its more in-house peers, and also allows for a certain degree of differentiation from the university while still remaining a custodian of the brand.

Much like UCL Enterprise, the wholly-owned subsidiary generally fulfils a number of roles beyond tech transfer. With Isis as an example, the company incorporates the TTO, the university's consulting arm, and its tech transfer consulting arm Isis Enterprise. It has also been a driving force behind setting up Oxford's angel investment group Isis Angels Network, which provides early-stage access to capital, and has now set up two seed funds with fund manager Parkwalk Advisors, while also running an incubator focused on software development.

Key points
- More autonomy
- Ability to have greater oversight over financial instruments
- One-stop shop for businesses looking for Oxford expertise

The partly-owned business

Drawing on the enterprising spirit of Imperial College London, its TTO, Imperial Innovations, has the university itself retaining only a small stake of about 20% in a listed entity. It floated in 2006, and trades on Aim, London's alternative investment market.

This means that not only does Imperial Innovations manage the TTO operation, it also plays the part of active venture investor. It has a broad reach, with agreements with Oxford, Cambridge and UCL as well as Imperial as potential sources of companies to back.

Key points
- Ability to run the company as the business sees fit
- Draws from university IP, but is not governed by parent institution
- Allows for cross-university collaborations
- Can hold an initial public offering (IPO) and act as a venture capitalist

Outsourced TTO

As an alternative to running its tech transfer operation, a university can opt to hand over responsibilities to an entirely separate entity. This was the case with Cardiff and Sheffield universities, which outsourced their TTO operations to UK-based commercialisation company Fusion IP, which was acquired last year by fellow commercialisation firm and investor IP Group.

This can be an easy way for TTOs to gain critical mass and access to funding, resources and regions that a university would not have been able to provide on its own. However, the downside comes in the form of removing tech transfer from the university bracket entirely and putting it into the hands of corporates. While this is excellent for fellow investors and other companies, it does take tech transfer away from its founding mission to translate university IP if it can be done and adds a profit element that can take priority.

Key points
- An effective way to build cross-university critical mass
- Can quickly substitute an underresourced office with a well-trained one
- Places profit above the university mission

Regional TTO

One of the biggest shake-ups in tech transfer approach has been taking place in France over the past few years, where universities and research institutes have moved away from running their own TTOs in favour of a regional TTO model where 14 sociétés d'accélération du transfert de

Leading universities in technology transfer: Global University Venturing 2014 rankings

University	TTO	Our ranking	World ranking	Disclosures	Patents issued	Licences	Revenues ($m)	Startups
Massachusetts Institute of Technology	Tech licensing office	1	2	698	288	59	79.6	16
Pennsylvania	Penn Centre for Innovation	2	14	391	77	122	86.9	26
Cornell	Centre for Technology Enterprise and Commercialisations	3	16	395	73	135	131.2	14
Columbia	Columbia Technology Ventures	4	10	371	90	89	146	16
California Los Angeles	Intellectual property and industry research alliances office	5	20	359	95	91	23.4	17
Johns Hopkins	Tech transfer	6	17	441	77	133	17.9	8
Stanford	Tech licensing office	7	3	502	Patents outsourced	103	87	9
Washington	Centre for Commercialisation	8	26	462	60	51	41	9
California San Diego	Intellectual property and industry research alliances office	9	35	351	62	49	22	15
Oxford	Isis Innovation	9	5	313	100	98	18.77	4
Northwestern	Innovation and new ventures office	11	23	212		66	130	11
Cambridge	Cambridge Enterprise	11	4	124	204	109	27.09	4
California Institute of Technology	Tech transfer office	13	6	268	144	58		11
Michigan	Tech transfer office	13	19	421		108	14.4	9
Harvard	Tech development office	15	1	414	74	34	15.2	9
New York	Industrial liaison office	16	29	172	56	40	214.2	8
Imperial College London	Imperial Innovations	17	12	386	43	32		11
Edinburgh	Edinburgh Research and Innovation	17	27	199	62	51	8.16	4
Illinois at Urbana Champaign	Technology management office	19	30	191	72	46	4.91	6
Chicago	UChicagoTech	20	8	163	24	50	20.5	5
Toronto	Research and innovation	21	18	166	10	36	3	12
California Berkeley	Intellectual property and industry research alliances office	22	11	164	48	41	5.1	6
University College London	UCL Enterprise	22	15	139	41	51	15.2	1
British Columbia	University-industry liaison office	24	34	152	66	31	5.4	5
Princeton	Tech licensing office	25	7		29	33	9	

Source: Global University Venturing

The rankings were calculated by:
- Taking tech transfer statistics from the top-ranked universities in the world (QS, ARWU, and THE rankings combined).
- Ranking each institution by individual metrics from 1 to 25. For any institution that could not provide a statistic in a certain category (for example, Stanford outsources its patenting activities while Imperial Innovations does not provide revenues made specifically from technology transfer activity with its financial data), universities were ranked or joint ranked in last place for that category.
- An average of scores in each category was calculated and used to award a ranking position.

The top 25 universities which made the final table were not necessarily in the top 25 of the combined world rankings. The reason for this is that some of the universities in the top 25 (for example, Karolinska, Yale, Tokyo) neither provide statistics online nor responded to our requests for information.

technologies (Satts) have been established, similar to Max Planck Innovation, the TTO that oversees innovation coming out of the 78 Max Planck institutes in Germany.

It is still early days for the Satt programme, which began in 2012 with €78m ($93m) of backing from the French government, but by collating independent efforts, a regional or collaborative TTO instantly gives institutions critical mass. The benefits of this are threefold. First, it presents a single entity in any given region for businesses to work with, which translates into a wider range of

technology and know-how to draw on and less legwork for companies. Second, it allows for state and university funding for tech transfer to be focused as opposed to diluted. Finally, universities that previously relied on a small team can now draw on a larger, often better-resourced, team.

Key points

- Allows a number of universities to combine efforts under one roof
- Creates critical mass
- Creates a well-trained and well-resourced tech transfer operation out of a fragmented model

Incubators

As innovation rises on the university agenda, incubators are becoming increasingly important in providing a fertile nurturing ground for both student startups and spin-outs. In essence, there are three types of incubator on which a university can draw – university-owned, university-affiliated and independent.

University-owned

When the University Business Incubator Index (now just UBI Index) published its inaugural rankings two years ago, SetSquared was rated as the number one incubator in Europe – a spot it held for a second year as it moved up the rankings to become the second-highest-rated incubator in the world, only behind the efforts of Rice University in the US.

In just over a decade of operation, SetSquared has seen 1,000 companies pass through its doors with an average 80% three-year survival rate, and which collectively have secured $1.5bn in external financing.

Similar to the Satt model in France, SetSquared is working collaboratively. The incubator goes further than treating incubation just as a necessary box that needs to be ticked to attract students. Whereas many universities are looking to sustain individual incubators, SetSquared is a combined effort of the UK universities of Exeter, Surrey, Southampton, Bristol and Bath.

This gives SetSquared both critical mass and a wider pool from which to build ideas. Both students' startups and spin-out companies from all five universities can add to the mix, and the incubator is open to the public as well. It also pools mentoring, funding and know-how from all five universities into one portal all members can benefit from.

A combination of size, competency and success has helped build bridges between industry and academia. By allying themselves with SetSquared, companies can draw on talent, startup businesses and technologies, which also gives SetSquared's companies a clearer roadmap to market and funding.

It also makes a more appealing proposition for government cash. Last year, the incubator secured $5m to help spin-outs from its five universities cross the valley of death, resources provided in the form of increased mentoring, training and funds.

University-affiliated

Stanford's student-launched and managed incubator StartX is one of the most promising university-affiliated incubators. Launched in 2011 as a non-profit spin-out of Stanford's student enterprise department, the incubator has quickly made itself an integral part of developing Stanford's highly entrepreneurial culture.

Originally staffed purely by volunteers, StartX attract $800,000 from the philanthropic Kauffman Foundation in 2012, as well as a further $400,000 raised from a number of Silicon Valley

companies. The development of companies such as indoor GPS startup WifiSlam, which was sold to Apple in 2013 for $20m, quickly turned the university on to how the incubator was generating high-quality startups that had the potential to go the distance.

This led to Stanford getting involved more officially. At the start of the 2013-14 academic year, Stanford announced a $1.2m annual grant over three years to pay for additional facilities and staff, as well as the Stanford StartX fund. The fund, which is uncapped and drawn from Stanford's administration, now uses the incubator as a sounding board for investment, investing in current and alumni companies of StartX that have raised $500,000 from angel or venture investors.

To date, the fund has invested $31m in 82 StartX companies. Over the past four years 220 companies have pased through the incubator's doors. They have raised an aggregate $700m at an average of $3m per company, and a number have gone on to be acquired by leading tech firms such as Apple, LinkedIn, Yahoo, and Dropbox.

Independent

DreamIt Ventures in the US has been demonstrating a model for partnering universities at the early stage. DreamIt has been setting up incubators near universities, which it has been using as platforms to make investments. Typically, regular startups receive $25,000 for a 6% equity stake, and health startups receive $50,000 for an 8% stake, which can go up to $300,000 in seed backing. So far, it 170 firms have passed through its doors, generating $200m in external financing.

Its programme has spread to New York, Baltimore, Philadelphia and Austin, and DreamIt has partnered institutions such as Maryland, Johns Hopkins and Pennsylvania, as well as attracting corporates such as Northrop Grumman, Comcast and SingTel. In its second fund, DreamIt raised $30m, including $3m from Drexel University.

Funding

The idea is forming, the team is getting into place, but how does it secure the funding to develop?

Proof-of-concept funding

In navigating the valley of death – the funding gap between an idea being turned into a business and the business sustaining itself – the proof-of-concept fund helps before a seed-stage investment round.

Proof-of-concept funding allows spin-outs to demonstrate their business model and underpinning technology are financially viable. Generally speaking, the cash will be used to conduct further research and develop a technology, which can then be submitted to interested parties. This research will normally include projected revenues, an examination of the business model, further development costs and long-term financial projections. Increasingly, this is becoming an essential part of spin-out life as the fresh company seeks to demonstrate the viability of its long-term goals.

Funding can typically be anywhere between $5,000 and $150,000 in grants, depending on the institution offering it. There are also other sources of proof-of-concept funding outside the university, such as the European Research Council's Proof-of-Concept fund, which is available to any project that has already received council money.

Startup competitions

While proof-of-concept funding may be a viable option for spin-outs, student startups are normally excluded from the running. To fill their place, a number of universities now offer startup competitions. Run during the academic year, the prizes and frequency are dependent on the institution hosting them. The general rule is that there will be mentoring and working space rewards for winners, as well as cash prizes.

The largest competition of this kind is run by Rice University's Rice Alliance for Technology and Entrepreneurship, which is ranked by UBI Index the top university incubator in the world. Now in its 15th year, the Rice Business Plan Competition has grown from nine teams competing for $10,000 to 42 international teams vying for cash prizes that amounted to $2.9m last year. At least 155 past competitors are still in business today, and those companies have gone on to raise a total of $844m.

This year's winner, a child-focused smartband startup from Brigham Young University called KiLife, secured prizes worth $588,000, as well as a further $150,000 in services.

Rice has achieved this by bringing on board a number of partners, including the Kauffman Foundation, Silicon Valley Bank, Gneral Electric, Wells Fargo, Nasa, Nasdaq, BP Shell, UK Trade & Investment, Baker Botts and others that contribute either funding or services for the eventual winners.

Seed funds

Depending on a university's location, it may already have external seed funds it can draw on, from private, corporate and government sources. However, a well-managed seed fund owned by the university and co-investing alongside angel and other seed investors can be an effective tool for generating the first tranche of cash a startup needs to grow past the proof-of-concept phase, as well as providing the means to engage with wealthy alumni, local individuals and small investors within its ecosystem.

In the UK, universities including Cambridge and Oxford have recently leveraged tax relief provided

A well-managed seed fund owned by the university and co-investing alongside angel and other seed investors can be an effective tool for generating the first tranche of cash a startup needs to grow past the proof-of-concept phase

by the Enterprise Investment Scheme and Seed Enterprise Investment Scheme. Offered by the UK government, the schemes are designed to offset the riskier investment in the early stage by reducing an individual's tax liability. This model has proven popular, with Cambridge raising three such funds and Oxford raising two since 2012.

In France, the Satts have been clusters for seed funding. IDF Innov, the Satt overseeing the Paris region, maintains a $6.7m seed fund, which is taken from the overall funding provided to each of the Satts when established. As a hub for all technology passing out of Paris's universities and research institutes, this means IDF Innov's seed fund is well placed to support some of the top-tier research coming out of France.

In the US, University of Illinois at Chicago (UIC) set up a $10m hybrid proof-of-concept and seed fund called the Chancellor's Innovation Fund. It is fuelled with $2m a year for five years, and managed by IllinoisVentures, an early-stage investment previously established by UIC. The funding is split 50:50 between proof-of-concept and seed investments, meaning IllinoisVentures will more often than not have already generated its seed investment pipeline through its proof-of-concept grants, meaning it already knows many of the companies it will be investing in.

Angel networks

Investors at this stage can be entrepreneurs themselves, pooling resources through angel networks.

Some universities have formed their own angel networks. Since 1999, the Isis Angels Network backs Oxford University's entrepreneurs, while Chicago University has leveraged its Chicago Angels Network to support entrepreneurs' international expansion.

US-based Duke University is in the process of establishing an angel network and innovation fund simultaneously with a goal of signing up 50 Duke alumni by the end of the year and doubling that number in 2016. Its Duke Angel Network will be supported directly by its innovation fund, which will co-invest $1 for every $3 the angel network provides. The innovation fund has received $2m in commitment from Duke, and the university plans to expand this to $20m.

Student-run venture capital

Michigan is a forerunner in student venture capital and has three student-led investment funds – Wolverine Venture Fund, founded in 1997 with a $2.5m donation, Zell Lurie Commercialisation Fund and Social Venture Fund. Each is aimed at providing investment to a specific part of the university's investment strategy while also providing the next generation of venture capitalists with hands-on experience.

Wolverine is probably the best-known of the three as one of the world's first such funds, and now draws from a $7m fund aimed at early-stage companies, both within and outside the university. Zell Lurie acts alongside Michigan's TTO, and provides access to capital for the university's spin-outs. The Social Venture Fund focuses exclusively on for-profit social enterprises, and invests at least $50,000 a time in companies focused on education, food systems, the environment and urban revitalisation projects that deliver both financial and social returns.

The business school at University of Wisconsin-Madison has had a course tied to a $1.5m fund since 1998 and has made 20 investments in student-run businesses.

Others have been more active. First Round's Dorm Room Fund is a three-year-old student-run venture firm with local branches in Philadelphia, New York, San Francisco and Boston, and has made about 80 investments, typically $20,000 drawn from First Round's limited partners, which are mainly large endowments and non-profits.

University venture funds

There are four ways a university can go about getting involved with venture capital – the solely-owned university venture fund, the collaborative university venture fund, investment in established venture capital firms and maintaining a close relation with a venture capitalist.

Although there are no global estimates for the number of such funds, in Europe the OECD in 2014 tracked 73 university funds, such as Seed Fund Chalmers in Sweden and Gemma Frisius Funds in Belgium.

There have been increasing numbers of all four fund types. Global University Venturing tracked 90 funds raising more than $5bn last year, with more this year, including Oxford setting a £300m fund target in May.

One of the oldest relationships between a university and a venture capitalist is Chicago's relationship with Arch Venture Partners. The VC was originally spun out from Chicago's own TTO, Arch Development Corporation, in 1992 and the university was an investor in its first fund. Now on its eighth fund, raised last year and totalling $410m, the VC acts independently of the university, yet keeps close ties with Chicago and the institution's peers at UIC and Northwestern as well as overseas in Japan.

State-backed business development organisation Enterprise Ireland has committed more than $1.4bn to seed and venture capital schemes, such as the €32m fund set up with Bank of Ireland for Limerick University spin-outs and startups. Limerick spin-outs have now attracted €80m in external funding and added 260 jobs to the local ecosystem.

Universities, such as Ohio State's $50m commitment to Drive Capital's $250m fund, can invest in independent VC firms through their endowments or, as with Stanford, from their balance sheet. Independent VC Osage University Partners has helped financial collaboration on investing in early-stage spin-out opportunities emanating from US universities. Now on its second fund worth $200m, the investor draws on 50 institutions in the US, typically co-investing alongside other VCs and providing spin-outs with access to capital in a fund that spans the whole country.

Finally, the university venturing fund – a fund managed by the university or its TTO. A notable example of how to establish such a fund is Cambridge Innovation Capital (CIC), an $80m fund launched to service Cambridge's tech cluster, the largest in Europe. CIC is an evergreen fund ploughing proceeds from selling positions back into the fund, ensuring in theory that there will always be a pot of money for Cambridge firms to draw on. It is also planning to hold an IPO to double the size of the fund, which, if CIC sticks to its original plans, will be held over the next 18 months.

In order to sustain the fund, CIC is investing across the Cambridge cluster, not just IP-driven companies coming from the university itself. CIC was cornerstoned by fund managers Lansdowne Partners and Invesco, which are taking a long-term view on their investments – a crucial part of establishing a university venture fund which will not be looking to provide returns within the normal VC cycle of 10 years or so. It was also supported by Cambridge's endowment, one of Cambridge's two $10bn valued spin-out companies ARM, IP Group, and a number of small "friends and family" of Cambridge made up of alumni and wealthy individuals within the Cambridge cluster.

The concept of a university venturing fund is a bone of contention at many universities. While the upsides are a big pool of cash to get spin-outs and startups off the ground, the conservative nature of a university can clash with the risky early-stage investments a fund is trying to secure.

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University investment: to fund or not to fund?

By Tom Hockaday, managing director, Isis Innovation

In my experience at Oxford University there has been a serious conversation about setting up a fund about once a year, usually prompted by approaches from potential investors or fund managers. Some of these conversations go on for many years. Oxford has not yet set up a fund, but Cambridge University has, through the £50m ($80m) Cambridge Innovation Capital fund. A more recent example is Epidarex, a fund involving a number of UK universities having close association with a fund, one university, King's College London, investing in the fund itself. Imperial College London has gone even further in some ways, as far as converting its tech transfer office into a venture capital firm, Imperial Innovations.

This article describes the advantages and disadvantages for those involved in setting up mid-sized investment funds to invest in a university's spin-out companies. A number of perspectives are considered – from the university, the investors into the fund, the fund managers, and the investee companies receiving money from the fund.

In summary, from the university perspective, the issue comes down to weighing the disadvantages of a tied fund with the benefits from access to capital and being seen as active in the area. The main winners are the people who manage the fund, who use their experience and sales ability to benefit from a great opportunity to earn themselves money.

University funds in context

The typical fund under discussion in this article is a mid-sized fund of approximately £50m structured along what many consider the typical venture capital model. The investors of the fund are "limited partners" (LPs) investing in a "general partnership" run by a group of fund management investment professionals. The fund intends to return money to the LPs within 10 years. The fund managers spend the first few years making investments, the next few nurturing the investee companies, and the last few exiting their investments.

The fund manager is paid a management fee of 2% to 3% of the funds under management, and 20% of the profits of the fund, referred to as carried interest in the success of the fund. The other 80% is returned to the LPs. There are variations on this model with longer-term investment horizons – generally a good thing – and corporate structures in which the funds for investment are held on the balance sheet of a limited company.

For a university, participating in a fund will involve committing to allow the fund to invest in its opportunities. This can be expressed as selling its dealflow, and we know investors are always in search of dealflow. In return, the university will probably receive commitments that investments will be made into its spin-out companies, and possibly a share of the profits. The extent of commitment made by the university is a crucial issue. The fund managers will insist on investment rights in order to raise the investment from investors. The investors will insist on the same if they see the opportunity to do so – the university is in a very uncomfortable position.

This is the most challenging aspect for the university. Can it make these commitments – what about views and existing obligations to research funders – and even if so, can it deliver on its commitments?

How does it put a value on its dealflow? How, for example, would a university plan to discipline an academic who first offered an opportunity to another investor?

This section discusses some related issues for such funds. The following section will set out the advantages and disadvantages of a fund from four different perspectives – the university, the fund managers, the investors and the companies.

Proof-of-concept funds and seed funds: Many universities already have a proof-of-concept fund and seed fund of one sort or another. In Oxford, Isis manages the £4m Oxford University Challenge Seed fund and the £2m Oxford Invention fund. Such funds are different from the investment funds discussed in this article. Proof-of-concept and seed funds are often made up of grants from government agencies or donations from foundations, charities and wealthy individuals. This is "soft money" from those looking to support the tech transfer activity as a worthwhile activity itself, and sometimes also seek returns to make money for reinvestment into the fund, so that it becomes an "evergreen" fund. A leading example in the US is the Deshpande Centre for Technological Innovation at Massachusetts Institute of Technology, which provides education and mentoring support, as well as funding to develop technologies closer to market.

These funds typically provide money in three areas – first, back in the university research laboratory to develop prototypes, do more experiments to show the potential of the idea, and provide more data to support a patent application; second, to purchase services in the fields of market research, competitor analysis and purchase the time of individuals who may be part of a new spin-out company; and third, as equity investment into the first-round funding of a new spin-out. The objectives of the funds range from making financial returns – often to become self-sustaining evergreen funds – to pure philanthropy.

Venture philanthropy: The investment funds discussed in this article are not venture philanthropy funds. Venture philanthropy funds aim to combine financial and social returns. In some structures the

model is a financial return to investors limited to X% with returns above X% being donated to charities, including a university. In others the concept is to use investment methodology and management disciplines to generate greater benefits from philanthropic donations.

Endowment management: Universities with capital endowments manage the investment of their capital in a variety of ways, often investing in funds of one sort or another. This is not the subject of this article at all, other than the point addressed below, that a university may well be an investor in a fund, and this investment may be from the university's endowment management arm.

Fund objectives: Establishing clear objectives for the fund is essential. If there are external investors involved, then the objectives are likely to be very clear – to make high returns from a high-risk investment. The objectives for the university are likely to be less clear, possibly an unknown mixture of making money and supporting technology commercialisation. Such a lack of clarity is a problem for the university.

Advantages and disadvantages of a fund from four perspectives

	Advantages	Disadvantages
The university including the university's tech transfer office	• Readier access to investment finance in its spin-outs • A share of the carried interest in the returns from the fund • Profile and PR benefits in being seen to be active in this area • Fund attracts other investors to co-invest	• If the tied fund turns down an investment, others are unlikely to invest • If the tied fund says yes, it is difficult to get a good price • Conflicts of interest if university has part of the carried interest • Opportunities are pushed down a spin-out route to feed the pipeline even if not the optimal route to commercialisation • Transfer of control of some technology transfer activities from the university to the fund • The fund managers may not succeed – they and investors will blame the university
Fund managers the people who manage the fund	• Live off the management fee, irrespective of performance • Substantial upside from carried interest if successful performance	• Find it difficult to manage another fund if unsuccessful
Investors in the fund	• Potential high investment returns • Opportunity for follow-on investments	• Dealflow from one institution unlikely to be sufficient • Potential loss – fund may not make decent returns • The usual risk of investing in the fund management team – can this size of fund attract good-enough managers?
Companies the investee companies who receive investment from the fund	• If the fund invests, they have cash and a supportive investor	• Are they getting a good deal? • If the fund says no, the company has to explain this to all other investors

Universities: The decision for a university to participate in a fund is not straightforward. There are benefits and there are risks. The risks arise from the investment community knowing there is a tied fund, and the university dramatically limiting its options for a period of time.

Fund managers: These are individuals risking their careers on managing a university fund. Fortunately for them, the conventional reward structures of the management fee mean the actual risk is negligible. The challenge comes from attracting fund managers of sufficient quality that everyone comes out smiling.

The quality of the fund managers for small and medium-sized funds is of paramount importance. Running a larger fund requires financial engineering skills (leverage, MBO, MBI, M&A) that are not as important for success in a small to medium-sized fund. In the funds being considered here, technology fund managers must have skills in selecting and then nurturing the opportunities to avoid

failed investments. A helpful quotation from Nassim Taleb – Antifragile 2012: "Because all surviving technologies have some obvious benefits, we are led to believe that all technologies offering obvious benefits will survive." They do not.

Investors: Investing in early-stage technology companies is a high-risk move. Investors should be experienced, and allocate only a small proportion of their portfolios to this asset class. It is always worth remembering that, as financial services advisers could say, the value of investments can go up as well as down.

Companies: Technology companies need capital to grow. They also need high-quality advice and supportive shareholders. It is often a major challenge in early-stage technology companies to align the specific interests of fund managers with other shareholders and management in building long-term substantial sustainable business growth.

Conclusions

More universities are considering an involvement in mid-sized venture capital investment funds to support their tech transfer activities. This typically involves selling their dealflow to a fund in return for a share of the carried interest or simply to support the existence of the fund. There are substantial disadvantages to having such a tied fund, and the university needs to be clear it can absorb these. The university will be asked to make commitments that it has the confidence to deliver.

One clear beneficiary of the fund is the fund management team. If a university wants venture capital returns, it can invest in a proven fund manager, and why then limit dealflow to one institution – even if it is your own?

This article was first published in Global University Venturing in September last year before Oxford's decision in May to set up a £300m fund

Insights from universities

By James Mawson, editor-in-chief

Global University Venturing has carried out its first survey of early-stage participants with the majority of the respondents coming from Europe and North America.

Regional breakdown

Europe (continental)	14/41
UK	11/41
North America	15/41
Asia	1 – Tsinghua

Source: Global University Venturing

This breakdown broadly reflects the Organisation for Economic Co-operation and Development's (OECD) regional analysis of the top 50 universities, primarily because many of these top universities answered the Global University Venturing survey.

Top 50 universities in 2013

US	34
UK	8
Netherlands	2
Switzerland	2
Taiwan	2
Denmark	1
Israel	1

Source: OECD scoreboard

Universities are increasing, and increasingly diverse in, their entrepreneurial support programmes

Regional differences show continental Europe broadly behind the US and some emerging-market academic institutions

Fewer than half of universities have specific corporate partnerships for startups

Global University Venturing then asked what programmes they had in place to support entrepreneurship on campus. Everyone said their institution had a technology transfer office (TTO).

There was more diversity by region on other support mechanisms. Half of continental Europe-based academic institutions had no incubator, or proof-of-concept, seed or university venturing fund.

By contrast, almost all UK-based institutions provided mentoring, incubator and startup competitions, while eight out of 11 that answered this survey question had a seed fund and six had a venture fund.

The UK results were similar in the number, albeit a lower proportion, to the US, which had six out of 15 with seed or venture funds.

What entrepreneurial support mechanisms do you provide?

Mentoring resources	32/41
Tech transfer office	31/41
Startup competitions	31/41
Incubator (owned by university)	24/41
Proof-of-concept grants	24/41
Seed fund	18/41
University venture fund	16/41
Corporate partnerships on entrepreneurship	16/41
Incubator (affiliated with university)	14/41
Student startup fund	12/41
Student-managed venture fund	2/41

Source: Global University Venturing

The main support mechanisms, however, disguised a welter of initiatives going on at the most innovative universities. These included student crowdfunding sites and entrepreneurship programmes, university challenge-originated funds, with continuing close ties to the university, an integrated TTO company and research park, accelerators, "advanced hackspaces" and "makethons", grow-on spaces – scale-up incubator space – pre-incubation programmes, special statute for student-entrepreneurs and a university-wide "entrepreneurship" elective.

However, Tim Bernstein, partner at commercialisation firm Yet2, said: "Our corporate clients would not be that interested in the universities or research centres that score highest across a broad set of entrepreneurial measurements. Seems like those would primarily just be the bigger universities."

Rather, he said, corporates would be more interested in the universities and research centres with:

- The most prolific flow of new ideas and startups.
- The best track record and commitment to developing startups and technologies beyond standard academic realm, further toward realistic markets – includes resources and capabilities and a willingness to develop beyond lab scale, especially an ability to generate comparative performance data.
- The most realistic view of the economics of working with industry – an understanding that no one can expect $500,000 or $1m in industry sponsorship or license cheques up front.
- Most transparency in decreasing the level of effort required to find relevant valuable opportunities – help to filter the wheat from the chaff.

But just as nearly half of the corporations surveyed looked to universities for help in their early-stage entrepreneurial endeavours, so nearly half (16 out of 41) of universities had specific corporate partnerships concerning entrepreneurship.

However, when asked what were the top three most innovative corporations – national and international – with which they had worked at the university, there was some separation by region. The majority, 40, of "innovative" corporate partners for each university were local firms, while universities chose 27 from a continent separate from their home territory that they valued working with.

For continental Europe respondents, all bar four universities, including two in Russia, chose local corporations or their own startups. In the UK, the mix was mainly UK and US businesses but with some continental European corporations. For US universities, the mix was mainly domestic businesses with some in continental Europe but none in the UK.

Universities' most innovative corporate partners
(those with at least two nominations from different universities)

Dow
GlaxoSmithKline
Google
Novartis
Rolls-Royce
Samsung
Syngenta
Source: Global University Venturing

Being able to attract and work with the best and most innovative multinational corporations is an important signal that the work done at a university could be globally significant, while building strong ties with the local business community benefits society and the economy.

Some countries have taken less interest or have been less successful, with a number of universities responding to the Global University Venturing survey unsure how to answer, but universities have played a central role in other regions where this has already occurred, notably on the east and west coasts of the US.

The public University of California system, which has regional campuses in Los Angeles (UCLA) and San Diego among other sites, are individually and collectively powerful, and recently set up a $250m university venturing fund to back its student and faculty entrepreneurs.

UCLA alone said its statewide impact was through employment – 103,000 people being paid an aggregate $5.6bn, output of $12.9bn, tax generation of $1.9bn. UCLA startups alone contributed employment of 4,411 being paid $295m, delivering a combined output of $1.1bn and local, state and federal taxes of $108m.

In northern California, research conducted in 2011 by two local professors found Stanford University's economic impact via innovation and entrepreneurship by Stanford alumni companies had posted aggregate world revenues of $2.7 trillion annually and had created 5.4 million jobs since the 1930s.

This followed research published in 2009 by one of the Stanford authors, Charles Eesley, into Massachusetts Institute of Technology's (MIT's) entrepreneurial impact on the east coast.

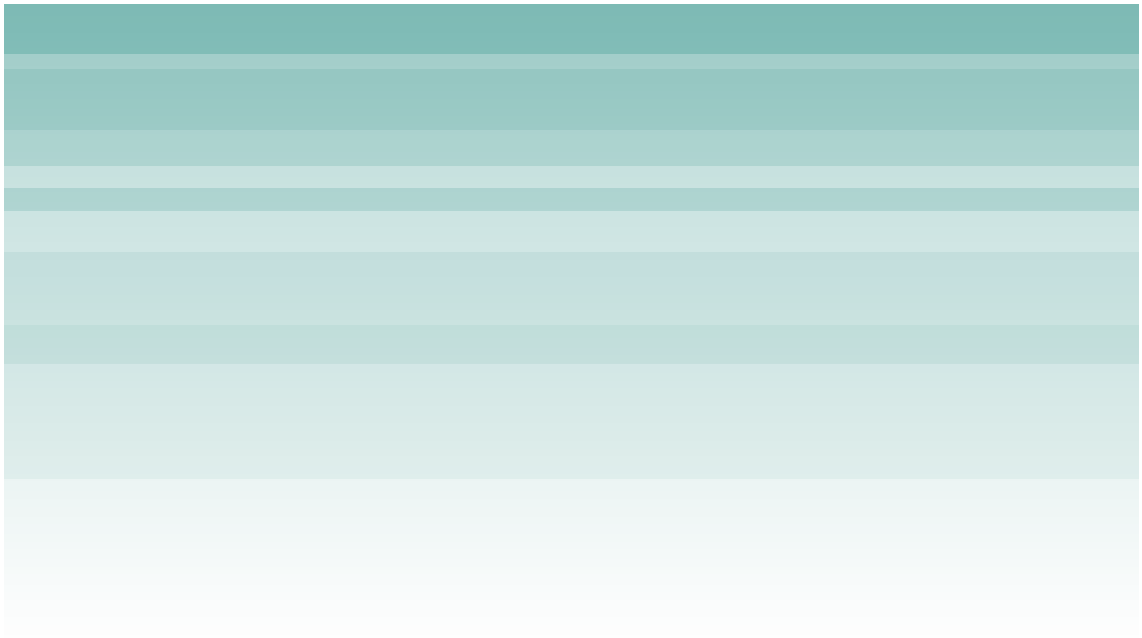
In its less-conservative direct extrapolation, MIT found 25,800 then-active companies founded by its alumni, employing about 3.3 million people and had aggregate annual global sales of $2 trillion, producing the equivalent then of the world's 11th-largest economy.

This level of impact takes decades to show up and requires an ecosystem that can reinvest in its talent. Katharine Ku has been director of Stanford's of technology licensing office since 1991 and in a series of blogs set out more than a decade ago some of the prerequisites for successful licensing activities.

Similarly, Lita Nelsen has been part of MIT's technology licensing office since 1986, and has been its director since 1992, and on winning the Global University Venturing lifetime achievement award last year said: "My husband and I graduated from MIT in the 1960s, and each of us joined our professors' startup companies."

The talented also reinvest in their innovations, and by helping others build a collaborative ecosystem their alumni and institution can also benefit from. Nelsen, keynote speaker at this year's combined Global Corporate Venturing Symposium and Global University Venturing: Fusion summit, was instrumental in setting up the UK's TTO association, PraxisUnico, while MIT has partnered a host of other regional initiatives, from Russia to Portugal in Europe and across the Middle East and Asia.

While attention is naturally focused on the current crop of top universities primarily from the US and Europe, institutions from other regions have been learning best practices and applying them to their local conditions



In Europe, the history of a university's impact can be even longer, and could be, as Uppsala University, the oldest university in Sweden and the Nordic region, said: "Huge. We have been here for more than 500 years, the last 400 years as a major part – more or less dominating – of the city.

"Many of the companies in the local environment [that] are big companies [and] part of international company groups such as GE [and] Thermo [Fisher Scientific], started as spin-outs from the university 40 to 50 years ago.

"Other global companies, such as ABB [and] Sandvik, recruit a lot of our students every year. Government officers and public officers are [also] often recruited from Uppsala University. The University Hospital is the biggest employer in the region, with about 10,000 employees and both national and international patients."

In the wake of MIT's and Stanford's influential economic reports, other universities have updated or looked more closely at their impact.

UK-based Birmingham University said in early 2013 that consultancy Oxford Economics had calculated its economic impact on the city of Birmingham and the West Midlands region, following a similar economic impact study in 2005-06. The consultants said the university generated £1.07bn

($1.66bn) of spending in the West Midlands economy in the 2011-12 academic year, a 38% increase since the 2005-06 study, made a value-added contribution of £530m to the region's economy, supported 11,830 jobs in the region, including a high proportion of highly-skilled roles, was a net importer of talent to the region, and attracted £145.5m of research funding in 2011-12, 87% of the research income received by all Birmingham higher education institutions and 12% of the region's total research and development spend.

Imperial College London said it had a large global impact but regionally was "a large employer and creator of skills and talent", adding: "Our spin-outs start out in London, employ thousands of people and have raised over £1bn of capital. The new Imperial West development – a £3bn campus – will be an ecosystem for innovation with university, investors, startups, incubation and industry all co-located in west London."

In Scotland in the UK, University of Strathclyde's Economic Impact Study for the 2012-13 academic year by consultants Biggar Economics found the institution provided £276.5m in gross value added (GVA) and 7,805 jobs in the city of Glasgow and £527.5m GVA and 13,194 jobs in the UK.

And while attention is naturally focused on the current crop of top universities primarily from the US and Europe, institutions from other regions have been learning best practices and applying them to their local conditions.

Sergey Kortov, a vice-rector of science and innovation Ural Federal University UrFU (Ekaterinburg) in Russia, said his university was "a socially-responsible, higher-education establishment".

He added: "It vigorously participates in solving the region development priority tasks, acting as a partner of regional and local administrations in implementation of social infrastructure strengthening programmes and improvement of services quality in social and cultural spheres."

He listed the following forms of contribution to social-economic development of the Ural region – collaborating with educational establishments, art, culture, sports and other organisations and financial and organisation support of events directed to solve problems in the community.

Tsinghua University said it was one of the most prestigious universities in China as its alumni include 26.8% of the Chinese Academy of Sciences, 17.6% of the Chinese Academy of Engineering, more than 400 ministers, vice-ministers, provincial governors and vice-governors, as well as many presidents and vice-presidents of universities. Yi Jiang, general manager of the Xin Centre-Tsinghua University, said last year Tsinghua had filed 2,010 Chinese and 400 international patents, and had 30 patents transferred and 31 licensed, valued at RMB150m ($24.2m). It had between two and five spin-outs and at least 20 student startups.

This puts Tsinghua in the top tier of research commercialisation centres.

How many spin-outs – companies based on university IP – did your institution generate in the last academic year?

0	1
1-2	7
2-5	13
6-9	8
10-15	4
16-20	1
20+	3

How many student or graduate startups did your institution generate in the last academic year?

0/don't know	9
1-2	4
3-5	5
6-9	2
10-15	2
16-20	1
21+	11

Source: Global University Venturing

In Europe, many TTOs felt underresourced or were building up their focus in this area. Russia-based UrFU said during the latest academic year of 2014-15 nine startups were created on its grounds after changes in the past 18 months.

Another respondent based in the UK said: "We had about eight invention disclosure forms last year, about £280,000 of revenue skewed heavily by a key licence, perhaps half a dozen patents filed, but patents are not the driver, they are a consequence of our commercialisation activities. All this needs to be seen in the context of two full-time tech transfer staff catering for all the intellectual property (IP) issues emanating from the university and a research income of only £10m."

Another said its licensing revenues were generally around £750,000 annually, ranging from £500,000 to £1m over the past five years, after its "structured IP panel process that assesses opportunities prior to invention disclosures and patent filings", which results in a "very high percentage of disclosures being filed [25-30 a year] and patents ultimately issued".

In the US, the Association of University Technology Managers (AUTM) in its latest survey found 5,198 licences were executed and 818 startups were formed out of academic research in 2013. However, the AUTM said: "Only 70 institutions reported this startup company data, against a total population of approximately 300 institutions. Most tech transfer offices do not have the resources to track this data, so these numbers are grossly underrepresentative of the true impact of technology transfer on job creation."

Lacking resources can hamper the support institutions offer to entrepreneurial students after graduation but many of the most successful offer a wide sweep of options.

Tsinghua said it had an incubator and accelerator programme, X-Lab, to support the entrepreneurship of Tsinghua alumni, and had university venture funds to which those startups could apply.

In Russia, within the innovation infrastructure of UrFU, there is a centre of technologies transfer and entrepreneurship.

Across continental Europe, most respondents broadly echoed one answer: "Not sure if it is the task of a university to provide post-graduation services to students," leaving these services mainly to federal, state and other programmes, such as Exist-Gründerstipendium and Junge Innovatoren in Germany.

In the US, in the Pittsburgh region, there are several accelerator programmes and funding, often with state and federal support, while a number of universities can provide a few years of mentoring and use of their incubation facilities, as well as courses on how to start your own business, workshops, networking events and guidance on where to find the support you need.

The attitude among public academic institutions is increasingly following that of privately-funded peers that faculty and alumni are important beyond the few years they spend on campus. As one US respondent said: "[They are] always [Johns] Hopkins family."

Data on corporate-backed university spin-outs

By Thierry Heles, reporter

Sister titles Global Corporate Venturing and Global University Venturing analysed last year's data to identify the top corporate investors in university spin-outs. Looking at global spin-out deals, the vast majority of investments by number were made by non-corporations, such as universities, their tech transfer offices and funds, angels, governments or venture capital firms.

Corporations backed 161 university spin-outs in 2014

Increasing activity in early stage

Of the venture capital firms, the majority of deals were made by firms that specialise in spin-outs, such as UK-based IP Group, which was involved in 10 deals (increasing to 11 if we add Fusion IP's one deal before IP Group's purchase of the investor in January), UK-based Mercia Fund Management, which participated in six deals, or US-based Osage University Partners, which also made six investments.

Looking at corporations as a source of support and capital, last year Global University Venturing tracked 559 university spin-out deals ranging from seed rounds to exits, of which a total of 161 involved a corporate venturing investor in the syndicate. Corporations are increasingly active in early-stage investing, according to Global Corporate Venturing data (see chart – separate file).

Corporations, therefore, were involved in less than one third (28.8%) of all spin-outs, which was a higher proportion then in venture deals more broadly. Last year, corporate venturers were involved in 17.8% of investment rounds to US-based companies, according to the MoneyTree Report from accountants PricewaterhouseCoopers and the local trade body National Venture Capital Association (NVCA), based on data provided by media company Thomson Reuters.

The top spot among corporate-backed investors was held by High-Tech Gründerfonds (HTGF), which leads the table with seven deals. The fund has €576m ($643m) under management, and is supported by Germany's Federal Ministry of Economics and Energy and development bank KfW, as well as a wide range of corporations, such as chemical producer BASF, pharmaceutical company Bayer, and logistics company Deutsche Post DHL.

HTGF invested in software company Codetrails (spun out of TU Darmstadt), organic solar film manufacturer Heliatek (Dresden Institute of Technology) alongside fellow corporates Bosch and BASF, cloud-based engineering company SimScale (TU Munich), life sciences company PS Biotech and augmented reality company Bitstars (RWTH Aachen University), biopharmaceutical company Rigontec (Bonn University), and exited microscope technology developer KonTem (Max Planck Society) when it was acquired by scientific instrument producer FEI.

The joint-second spot belonged to internet company Google and chip maker Intel as each participated in five deals. Google backed platform-as-a-service provider DNAnexus (Stanford University), artificial intelligence technology provider Kensho (Harvard University and Massachusetts Institute of Technology), while acquiring advertising analytics company Adometry (Stanford University) and artificial intelligence companies Dark Blue Labs and Vision Factory (Oxford University).

Intel's five deals were computer connectors maker Keyssa (University of California Los Angeles) in which it invested alongside Samsung, education technology company Schoology (Washington University), mobile chip maker Spreadtrum Communications (Tsinghua University), drone manufacturer PrecisionHawk (Indiana University), and semiconductor materials developer Inpria (Oregon State) also alongside Samsung.

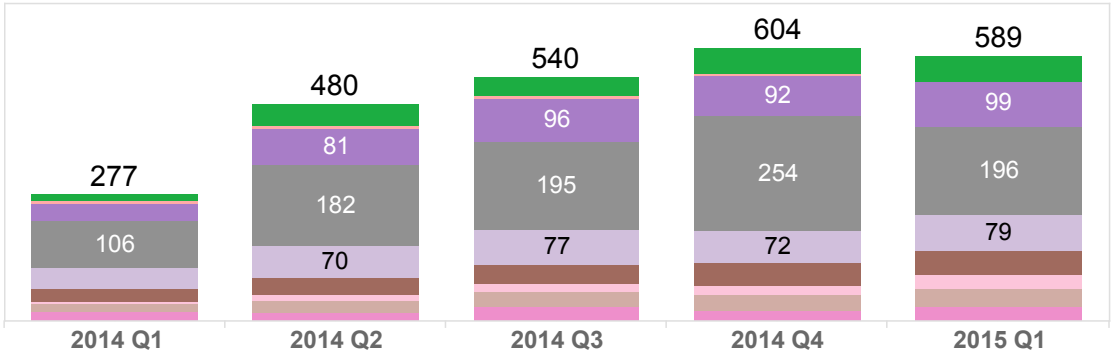
Further down the list, in joint fourth, were pharmaceutical company Novartis and conglomerate General Electric, which each participated in four deals.

Completing the top corporate investors are pharmaceutical companies Novo, Pfizer and Takeda, as well as electronics conglomerate Samsung, cloud computing software provider Salesforce, semiconductor maker Qualcomm and online marketing company Clicksco, each of which participated in three deals.

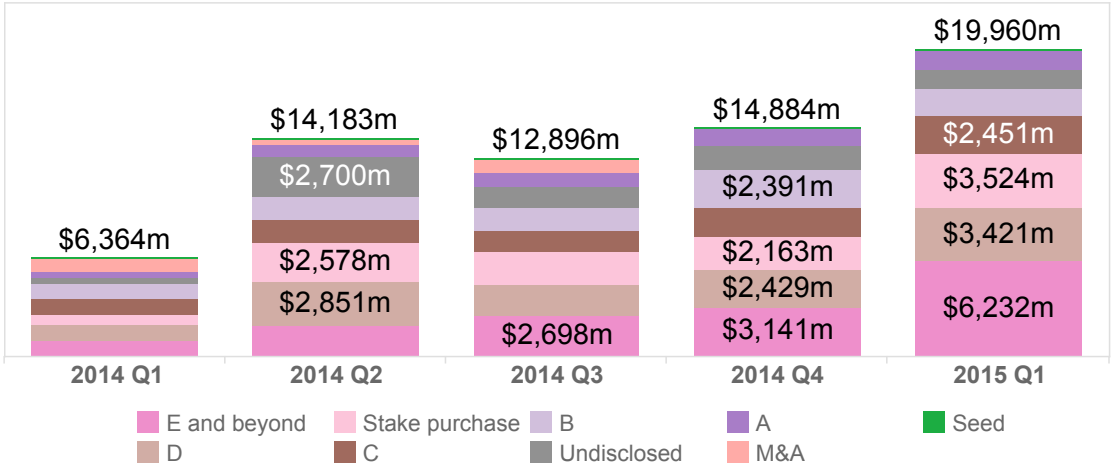
Other corporate investors backing spin-outs during 2014 made only one or two investments, such as software developer Microsoft, which joined a $1m seed round for Stanford spin-out Watchup, a daily news aggregating service for smartphones and Google Glass, and pharmaceutical companies Baxter, AstraZeneca and H Lundbeck.

Corporations' early focus 2014-2015Q1

Number of deals



Value of deals



Source: Global Corporate Venturing

Corporate interest has also been seen for university-focused VC funds, where 19 out of 93 new funds with disclosed limited partners (investors) included a corporate limited partner.

Perhaps unsurprisingly, those corporates that backed a fund often also participated in investment deals. For example, Google backed Flashpoint's $1m venture fund in June, pharmaceutical companies Pfizer, Eli Lilly, Johnson & Johnson and communications and IT company Harris & Harris all backed the $51.1m Accelerator IV fund, while HTGF can be found among the limited partners of Sablono's fund, which secured an undisclosed amount in August.

Overall, the pharmaceutical and healthcare sectors dominate again, with other funds attracting GlaxoSmithKline, Alexion, Mayo Clinic, Nationwide Children's Hospital, Kolling Institute of Medical Research and Cincinnati Children's Hospital, although technology companies such as SanDisk and Qiwi, industrial conglomerate Tata Industries and publisher Bertelsmann are also active.

University spin-outs in 2014

Spin-out	University	Amount	Round	Other investors
Bitstars	RWTH Aachen			
PS Biotech	RWTH Aachen, DWI Leibniz Institute for Interactive Materials			
Codetrails	TU Darmstadt			
KonTem	Max Planck Society and research centre Caesar		exit	FEI (acquired the spin-out)
Heliatek	Dresden University of Technology	$22.5m	series C	Bosch, BASF, Innogy Venture Capital, Wellington Partners, eCapital, Technologiegrunderfonds Sachsen
Rigontec	Bonn	$11.9m	series A	
SimScale	TU Munich			Bayern Kapital
DNAnexus	Stanford	$15m	series C	First Round Capital, Claremont Creek Ventures, TPG Biotech
Adometry	Stanford		acquisition	
Dark Blue Labs	Oxford		acquisition	
Vision Factory	Oxford		acquisition	
Kensho	Harvard, Massachusetts Institute of Technology	$15m	series A	Goldman Sachs
Inpria	Oregon State	$4.7m		Samsung, Applied Materials
Schoology	Washington	$15m	series C	Great Oaks Venture Capital, Great Road Holdings, FirstMark Capital, Meakem Becker Venture Capital
Spreadtrum Communications	Tsinghua	$1.5bn		
PrecisionHawk	Indiana		series B	
Keyssa	California Los Angeles	$47m		Samsung, Alsop Louie Partners, Nantworks
ThetaRay	Yale, Tel Aviv	$10m	series B	Jerusalem Venture Partners, Poalim Capital Markets
Vicis	Washington	$0.5m		US National Football League, Under Armour

Spin-out	University	Amount	Round	Other investors
Aver Informatics		$8.5m	series A	Drive Capital
Tangent Medical	Michigan	$5m		
Quartet Medicine	École Polytechnique Fédérale de Lausanne, Boston Children's Hospital	$17m	series A	Atlas Venture, Pfizer, Partners Innovation Fund
Anokion	École Polytechnique Fédérale de Lausanne	$37.5m	series A	Novo, Versant Ventures, private investors
ImaginAb	California Los Angeles	$21m	series B	Institut Mérieux, Cycad Group, Nextech Invest
BioNano Genomics	Princeton	$53m	series C	Legend Holdings, Battelle Ventures, Innovation Valley Partners, Federated Kaufmann Fund, Monashee Investment Management, Domain Associates, Gund Investment Corporation
Anokion	École Polytechnique Fédérale de Lausanne	$37.5m	series A	Novartis, Versant Ventures, private investors
Otonomy	Osage	$49m	series D	OrbiMed Advisors, TPG Biotech, Avalon Ventures, Domain Associates, RiverVest Venture Partners, Aperture Venture Partners, Osage University Partners, Jennison Associates, Perceptive Advisors, Federated Kaufmann Funds, Ally Bridge Group, private investment funds advised by Clough Capital Partners, institutional investors
Adaptimmune	Oxford	$104m	series A	New Enterprise Associates, Oxford University, OrbiMed Advisors, Wellington Management Company, Fidelity Biosciences, Foresite Capital Management, Ridgeback Capital Management, QVT, Rock Springs Capital, venBio Select, Merlin Nexus, and investors
Neoantigenics	Virginia		tech transfer	
NeuMoDx Molecular	Michigan	$21m	series B	Baird Capital, Arboretum Ventures, Wolverine Venture Fund
Quartet Medicine	École Polytechnique Fédérale de Lausanne, Boston Children's Hospital	$17m	series A	Novartis, Atlas Venture, Partners Innovation Fund
BioMotiv Accelerator	University Hospitals (affiliated)	$25m	stake purchase	
Matter Incubator	Chicago (backer)	$4.4m		NorthShore University HealthSystem, AbbVie, Astellas Pharma US, Avia, CDW, Comcast, Crain's Chicago Business, EdgeOne Medical, Ernst & Young, Healthios, Horizon Pharma, Insight Product Development, Jones Day, JPMorgan Chase, Marathon Pharmaceuticals, Medline, Marshall Gerstein & Borun, OSF Healthcare, Sidley Austin, Silicon Valley Bank, State Farm
Naurex	Northwestern	$80m	series C	Baxter, Lundbeck, Cowen Investments, EcoR1 Capital, Goudy Park Capital, Portola Capital Partners, Sabby Capital, Adams Street Partners, Druid BioVentures, Genesys Capital, Latterell Venture Partners, Northwestern University, PathoCapital, Savitr Capital
GigAbout	Teeside		tech transfer	
The Happiest Hour	Teeside		tech transfer	
Randomizer	Teeside		tech transfer	
Alchemist Accelerator	Stanford			
InsideSales.com	Stanford	$100m	series C	Polaris Partners, Kleiner Perkins Caulfield and Byers, Stanford University, Acadia Woods, Epic Ventures, Zetta Venture Partners, Sorenson Capital, Hummer Winblad Venture Partners, US Venture Partners
Bionym/Nymi	Toronto		tech transfer	Mastercard, Archangel, Export Development Canada, Relay Ventures, Ignition Partners
360fly	Carnegie Mellon	$17.8m	series B	Voxx International, Steve Altman
	Washington		tech transfer	Washington University's Commercialisation Gap Fund, Washington Research Foundation, US National Science Foundation, Washington University
Euvision Technologies	Amsterdam		exit	
Pennsylvania State University	Novasentis	$8m	series B	
Inpria	Oregon State	$4.7m		Intel, Applied Materials
Keyssa	California Los Angeles	$47m		Intel, Alsop Louie Partners, Nantworks

Source: Global Corporate Venturing

EUA seeks university-industry partnerships

By Thierry Heles, reporter

The European University Association (EUA) has been campaigning for harmonised policies across Europe for many years to facilitate university-industry co-operation. Lidia Borrell-Damián, the association's director of research and innovation, in April shared her insights on what further changes EUA wants and why they are important in the week that Rolf Tarrach, former rector of University of Luxembourg, was elected president for a four-year term.

Founded in 2001 through a merger of the Association of European Universities and the Confederation of European Union Rectors' Conferences, the European University Association (EUA) today represents 850 institutions across 47 countries counting 17 million students.

The EUA's stated mission includes the promotion of policies to strengthen universities' role in the knowledge society, and to this end the organisation has released a range of reports and case studies as well as guidelines on university and corporate partnerships since 2006.

Beginning with studies on collaborative doctoral programmes, which the organisation considers a first step to technology transfer, or indeed knowledge transfer, the EUA progressed to conducting 25 studies on universities engaging in long-term partnerships with industry, that is for more than five years, looking at how these relationships change over the years.

The EUA has made all its reports and case studies publicly available, providing detailed analysis of its findings in each document. Specifically, the association has endeavoured to identify main trends, needs and structures required by both universities and companies to ensure collaborations between the two are successful, extrapolating policies that would favour co-operation.

Based on its work, the association has been repeatedly invited to sit on expert groups for the European Commission (EC) and other European bodies, discussing its findings and conclusions with policymakers in order to influence legal frameworks.

One document, Responsible Partnering Guidelines, published in 2009, outlined some of the specific challenges of partnerships, noting that in order to guarantee beneficial outcomes for all involved corporations must recognise governments' goal to have universities play a significant part

The goal is an ecosystem of research-performing organisations and innovators and investors

This is not like a classic orchestra, with a conductor knowing perfectly which instrument is playing which note. You cannot plan for a research breakthrough, you cannot plan for an innovation breakthrough

in research commercialisation and spin-out creation. On the other hand, universities should realise that corporations' aim is to remain competitive.

It is the final part of the advice that has proven tricky, as governments need carefully to balance the needs of both university and industry and foster innovation with well-planned policies.

Lidia Borrell-Damián, director of research and innovation at the EUA, has expanded on this advice, telling Global University Venturing that a coherence of policies is absolutely necessary to support partnerships. Currently, policies both nationally and regionally often contradict each other for university and industry.

She said policies needed to be harmonised so they fostered, "interaction between research-performing organisations, including universities, and companies so that we can tackle major problems in society, education" and establish "a good internal trade policy".

Lidia Borrell-Damián: establishing "a good internal trade policy"

This, she added, was the only way for products to be "properly manufactured and distributed according to EC standards".

While EUA aimed to have these changes implemented, Borrell-Damián admitted it was an arduous journey and short-term thinking often won over long-term considerations, with politicians who tended to look only at five-year plans that covered the term of their government. Borrell-Damián said: "The goal is an ecosystem of research-performing organisations and innovators and investors."

She used the metaphor of a jazz band to describe how the different policies would need to work. "This is not like a classic orchestra, with a conductor knowing perfectly which instrument is playing which note. You cannot plan for a research breakthrough, you cannot plan for an innovation breakthrough." In fact, policymakers needed to recognise they "can only create conditions for those things to happen".

Long-term policies are indeed a complex topic, Borrell-Damián said, as "the innovation business based on research and innovation requires policies that leave margins for the unexpected to happen and to be able to capture it and manage it".

Policymakers should also refrain from encroaching too much, looking instead for settling "things for standardised processes" or nudging "things in a different way", but must not overlegislate, as that would severely stifle innovation. Only with such long-term policies in mind could politicians then agree on effective short-term policies to tackle immediate issues.

Borrell-Damián illustrated the economic need for a long-term approach, Europe-wide, by citing a figure from Eurostat, the EC's data collector, showing that in 2012 the EU produced 19.4% of all patents registered that year, compared with the US's 19.8%.

Yet despite being neck-and-neck in patents, the US is arguably better at marketing its innovations and commercialising its research, while the EU appears to have struggled to exploit its intellectual property

at a time when the continent is suffering from the after-effects of a financial crisis and continuing human capital flight.

As Borrell-Damián put it: "If all these 19.4% of patents really make it through, or at least 50%, and produce good value-added products, the growth would be enormous."

The closeness of the US and EU economies is seen as surprising for two reasons. First, large-scale initiatives, such as the French government's Satt (technological transfer acceleration company) initiative to set up regional tech transfer offices across the country, are still in their infancy. Second, in the EU, research is more often than not publicly funded, albeit at just more than half US levels and often with less resources than many US institutions that may have endowments of several billion dollars.

Differences between the two economies and legal frameworks produce different approaches to university-industry partnerships.

In the US, for example, there is very little concentration of research-intensive universities, while Europe counts far more such clusters that in turn can facilitate co-operation with companies. Public funding, such as the German Ministry of Economics and Energy's Exist programme, can stifle competition between universities.

Although the EUA is campaigning for changes, Borrell-Damián was relatively optimistic. "When you look at the rules of the game in Europe, you can see that many co-operations are ongoing and that is a growing phenomenon. You can see how universities and companies are co-operating more and more over time, and not just on research."

She added: "Normally the entry point is a university and a company coming together because there is a common research ground or a common problem that needs an in-depth approach to research. And it is here, when universities and companies come to an understanding on the terms, that they can establish a co-operation because it will be fruitful to all in the long run."

Such partnerships then often lead to internships, professorships and guest lectures, and provide a strong basis for future collaboration. The success of partnerships can then be traced and analysed through an online platform developed by the EUA, dubbed U-B tool, which takes into account 47 factors to generate a report about a collaboration.

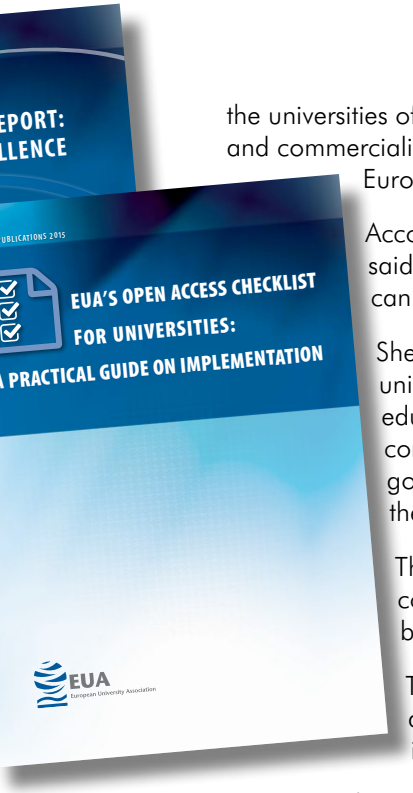
European universities, however, are looking beyond partnering to attract corporate sponsorship, to include partnerships to conduct research, share studies, set up joint programmes and commercialise intellectual property.

The EUA encourages such collaboration, although it also assists universities with setting up their own tech transfer offices both by referring to its case studies and reports and by guiding institutions to practices that have worked best for universities operating within a similar legal framework and regional policy.

Borrell-Damián said: "It is very difficult to build new capacity in-house all the time, because the number of topics is exploding, and the numbers of masters is too. One good way to move forward is to establish partnerships with other universities, and clearly commercialisation of their output is not different, because that is one thing universities are less experienced at. Partnering is becoming a good way to tackle the promotion of their research or patent portfolios or intentions to produce patents."

One example of co-operation between universities is SetSquared, a UK-based partnership involving

Developing countries must retain the autonomy to determine how their universities should participate in the growth of international higher education



the universities of Bath, Bristol, Exeter, Surrey and Southampton, which was set up in 2003 to identify and commercialise research. In 2014, SetSquared was selected as the best business incubator in Europe by UBI Index.

According to Borrell-Damián, European universities are perhaps also more idealistic. She said while they are good at recognising research and education themes, economic return can follow other priorities.

She said: "Of course they are worried about funding, but, more than economic return, universities never forget their main goal is education – education for all, not just education for graduates, for masters and for doctorates. And they are very aware that competition in the education field, or the higher education sector, relies on providing good education, and they can only do that if the outcomes of research feed back into the curricula."

This meant European universities tended to favour value-added partnerships with companies that could share their expertise with students over those that would merely bring a financial return.

The association's mission outline for 2015 and 2016 calls for increased visibility and impact of its work, its policy recommendations and its project outcomes at institutional, national, European and global levels.

In Europe, the next opportunity to help shape policy starts this month with the next phase of the Bologna Process – a series of ministerial meetings and agreements between European countries designed to ensure comparability in the standards and quality of higher education qualifications.

Internationally, the Transatlantic Trade and Investment Partnership (TTIP) between the EU and the US is expected to be agreed given high-level support by the two blocs, with the free-trade agreement expected to be finalised next year. One paper – The Transatlantic Trade and Investment Partnership: European Disintegration, Unemployment and Instability, published by Tufts University last October – estimated that after a decade of TTIP, Europe would suffer a net loss of exports, GDP, jobs, wages and government revenue, and push public deficits beyond the limits allowed in the Maastricht treaty.

The Trade in Services Agreement (TISA), encompassing 21 other nations as well as the EU and US, is also on the horizon, with the EUA planning to influence policymakers by providing evidence of the deals' implications.

In January 2015, the EUA's council unanimously approved a statement on the TTIP and TISA, which warned: "Higher education should not be transacted within a framework that puts the systems of developing countries at risk from corporate ventures located outside their borders. Developing countries must retain the autonomy to determine how their universities should participate in the growth of international higher education."

Instead, the EUA called for a greater degree of global governance under a model similar to that of the academic recognition frameworks supported by the UN Educational, Scientific and Cultural Organisation. The EUA's council said: "It is essential that TTIP and TISA protect both individuals' rights to privacy and universities' codes of conduct in respect of the openness of scientific collaboration, particularly with regard to the international transfer and secondary processing of data."

Meanwhile, the EUA is also hoping to set up a foresight initiative, which would consider global societal developments, their impact on universities and the EUA's role within those changes. The initiative would inform the association's strategic direction beyond 2015 under its latest president, Rolf Tarrach.

UIDP smooths academia and industry links

By Gregg Bayes-Brown, editor, Global University Venturing

There is a disconnect between universities and corporates, which happens for various reasons depending on who you talk to. Ask professors who have worked in academia all their lives what they think of corporates, and the range of responses goes from okay at times to cries and shouts about the devil appearing in fine suits. Ask corporate guys what they think of academics, and you can expect some sort of pithy remark about rubber-stamp cultures and taking six months to make a single point.

In truth, both are very different worlds, and pretty much speak different languages – something that makes the job of a journalist who sits in the middle tricky. At its core, the disconnect arises from differing goals that are hard to reconcile with one another – profit and prestige. At a company, the end goal is always the bottom line. But the bottom line for a university is often not money – it is about the quality of research, how that research is perceived and utilised, and how that can feed into teaching and a respected student body.

So, in 2006, when the University Industry Demonstration Partnership (UIDP), funded by the US National Academies of Science, was first launched with the goal of bringing corporate and university representatives together, all hell broke loose. "There was a lot of shouting and finger pointing," one delegate told me at the UIDP's most recent event. "It was all 'you guys don't do this' and 'you guys don't understand that'. It was a pretty chaotic affair."

However, a decade on, and the dissention of the past seems to have faded to mythical status at the UIDP. The once bumpy road of intellectual property potholes and low-flying accusations has been tarmacked into a smooth ride that exchanges viewpoints from both industry and academia fluently. The blame-fest has subsided, and at this year's UIDP at the Purdue University campus, both camps came together to identify hindrances to the effective flow of ideas from the minds of academics to the next billion-dollar company.

From a corporate perspective, the handling of intellectual property (IP) is a notorious snag on the road to harmony. The time it takes to get to an agreement – and the different timescales corporate and universities work on as a whole – was highlighted as a major barrier, as can arguing over the rights. Corporates said universities seemed more concerned about losing out on value from the next Google rather than recognising the value of collaboration. At the same time, universities want the lion's share of value while not appreciating the risk a corporate takes at the early stage.

There are other non-IP issues that corporates identified, such as more useful technology than the corporate can directly invest in, pointing towards angel and venture investors as ways to fill the gap, along with incubators. The transactional mindset of tech transfer offices (TTOs) was also highlighted, with the suggestion that universities should be looking to build longer-term partnerships with corporates. It was also said of TTOs that they do not always have a clear understanding of all that is going on inside a university, and should always be looking to expand their knowledge of their own ecosystems.

Universities have been responding to the feedback from corporates. With time an oft-repeated issue to overcome with corporates moving a lot faster than universities, some UIDP members have adopted express licence programmes to get IP out of universities faster, and have cut the red tape associated

Some UIDP members have adopted express licence programmes to get IP out of universities faster, and have cut the red tape associated with those licences so they can fit in better with a corporate's needs

with those licences so they can fit in better with a corporate's needs.

Another model universities have adopted is to hold patent auctions, where low-priority patents, some of which can be bundled together due to their close relations, are licensed exclusively. The process allows universities to get patents out rapidly, while also providing an event to promote industry-academic collaborations.

These are just some of the programmes developed through the free flow of communication between the two sectors, and universities also have the opportunity to inform corporates of how things are on campus, and of challenges the corporates need to overcome to make themselves more appealing to the university crowd. Generally speaking, it is that understanding of how universities work that institutions look for in a corporate partner, as understanding the barriers and potential successes in overcoming them together makes it easier for the academic partner to achieve its own goals.

Looking forward, the UIDP has just stepped out of the shadow of the National Academies of Science to become an organisation in its own right, making its independence official at the conference. The UIDP will also be looking to expand beyond US borders in the year ahead as it seeks to bring its own style of fostering university-industry collaboration to new countries.

IP is becoming easy to access

By Rosa Fernandez, head of research,
National Centre for Universities and Business (NCUB)

Intellectual properties (IP) are knowledge assets that both universities and business create, but to own and manage these assets they require legal rights. When most people think of IP they think of the rights that attribute ownership rather than of the knowledge content of the asset.

IP rights typically take the form of a document, such as a patent or copyright, which describes the knowledge content and attributes ownership. The rightful owner – person, institution or company – of this asset can then trade access to the knowledge content, often for money, using licence agreements.

Easy Access IP offers a simplified one-page licence agreement for universities to release some of their IP for free, to put it to the best use possible. Before the NCUB report on progress in the take-up of Easy Access IP, "one-page licence" and "for free" were the two memorable things that had resonated about the scheme. Now, we hope there will be a broader understanding that:

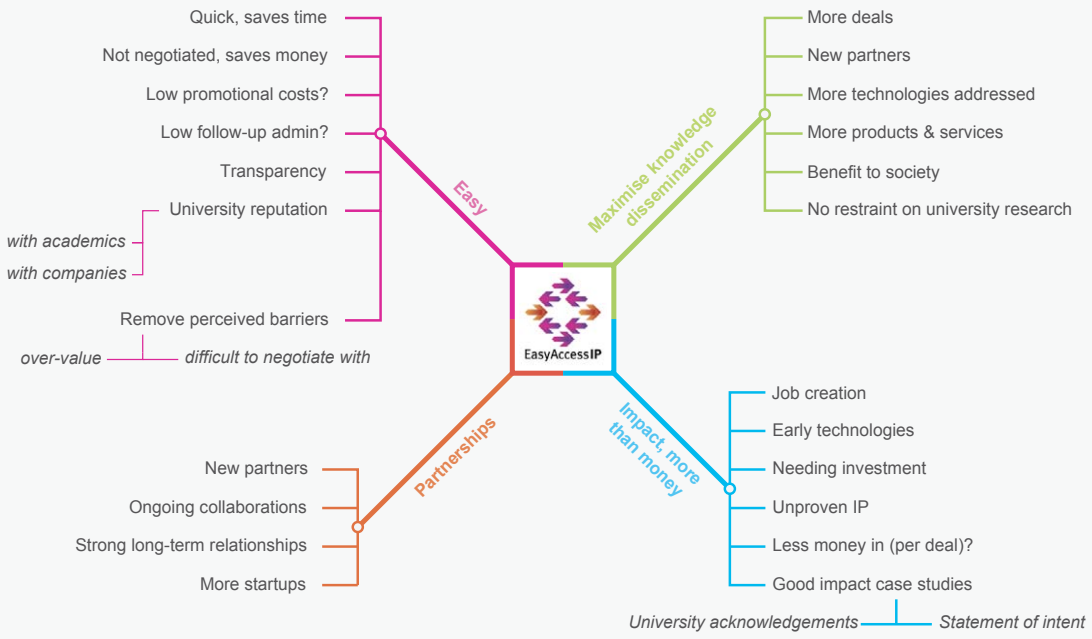
- Rights over IP are just the visible tip of the iceberg of knowledge assets in universities – and in business.
- Not all knowledge assets are the same.
- A single right of ownership or type of use would not maximise the value of every asset, either for the owner or for society.

Universities – and business – release a lot of knowledge "for free", including knowledge assets such as publications, but also knowledge over which they have no documented rights, such as informal advice or training received by students and employees.

Beyond quantifying progress in the take-up of the specific "one-page licence to release IP for free"

more bridges need building – but not at the expense of burning others that are already in use. Not everyone needs to use the same bridge at the same time

The aims of Easy Access IP



understanding of Easy Access IP, our report underlines the fact that there are many paths already in place for crossing the "valley of death" – the funding gap that lies between an idea being deemed fit for development (a patent is taken) and it being low-risk enough for a firm to take it forward (a licence is bought).

Admittedly, more bridges need building – but not at the expense of burning others that are already in use. Not everyone needs to use the same bridge at the same time.

Easy Access IP is one way for inventors to reach out to users of their ideas, particularly those users who want to test new ideas without having to commit to making them succeed. Sometimes inventors and users agree a commitment to success, and in this case sharing the profits through licensing works better than free access for both parties.

How do these mythical agreements come about? It is the role of knowledge asset managers, including tech transfer offices, to co-ordinate the growing portfolio of IP in our research base and how it is released for exploitation. We worked with them for this report and reflect their views in it.

These professionals work constantly to bring afloat the range of intellectual assets from the iceberg that sits beneath the IP rights tip, and naturally they welcome new tools for this.

For the sector as a whole, interest in Easy Access IP has contributed to raised awareness of knowledge asset management and the challenges it presents. For the NCUB, it is renewed evidence that university-business collaboration is principally mediated by people.

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Corporations put the spotlight on early stage

By Toby Lewis, editor, Global Corporate Venturing

Nearly half of corporations look to universities for early-stage ideas

Many of the most innovative corporations look the most globally

Corporations running more accelerators and investing in the startups

Global Corporate Venturing has carried out its first survey of early-stage participants. We had 114 respondents to the survey, with 70 corporates, and corporate-backed operations responding alongside some financially run accelerators, governments and others.

The world of universities has won the interest of nearly half those canvassed, with 48.1% of early-stage respondents to the report looking to the universities and business schools for portfolio companies. A further 37.7% look for spin-outs from universities.

Given this approach it is perhaps surprising that only 6% of groups said they had a specific university or academic liaison officer.

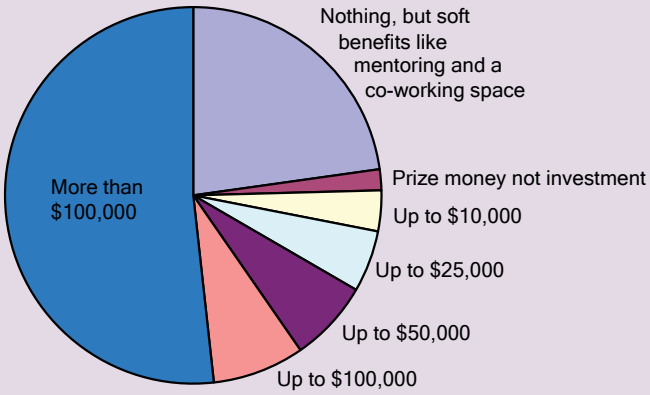
The most common approach remains to network in the entrepreneurial community, with 88.7% of respondents saying their principal hunting ground is the startup scene and entrepreneurial network.

And the scene is global to the most innovative corporations, with 35 out of 112 who responded to this question being active in early-stage entrepreneurship outside of their home continent.

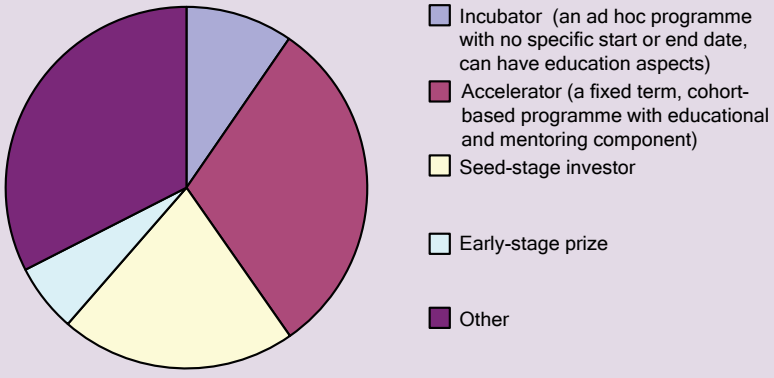
The composition of respondents was varied, with 40.3% being corporate-backed and independent accelerators or incubators, 21.1% solely seed-stage investors, while 6.1% run an early-stage prize.

The portfolio companies of nearly a fifth (18.5%)

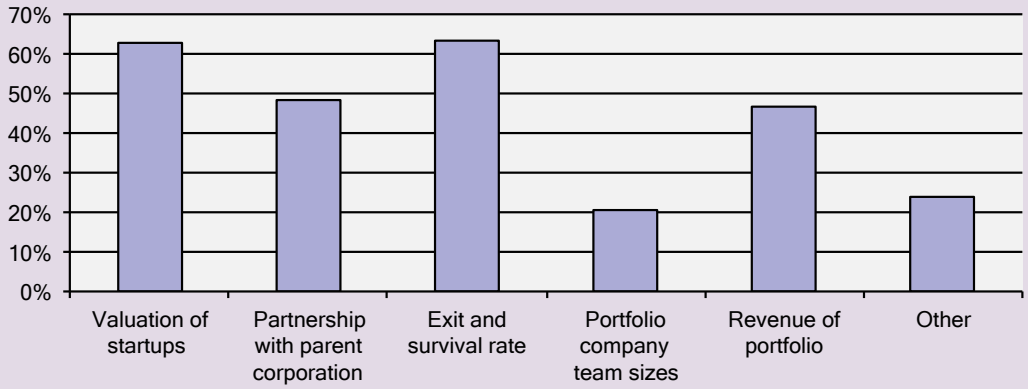
How much does your early-stage programme invest?



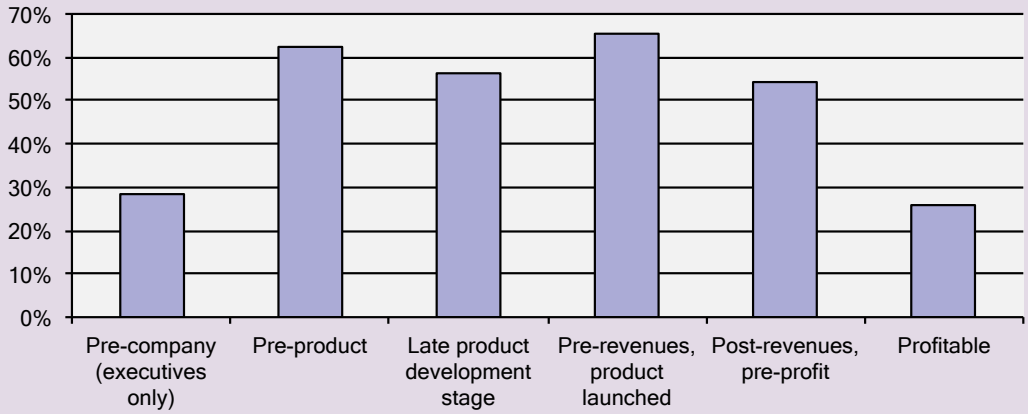
What type of early-stage programme are you?



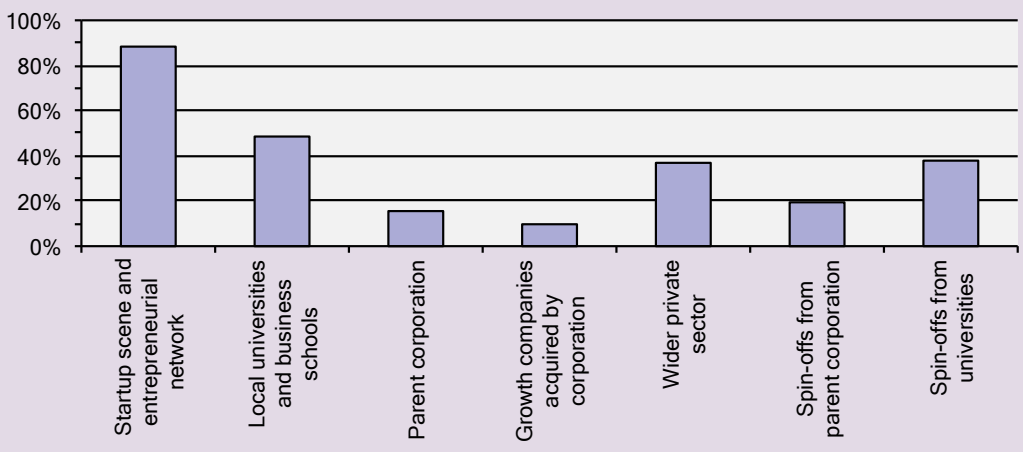
What metrics do you track to measure the returns of your early-stage programme?



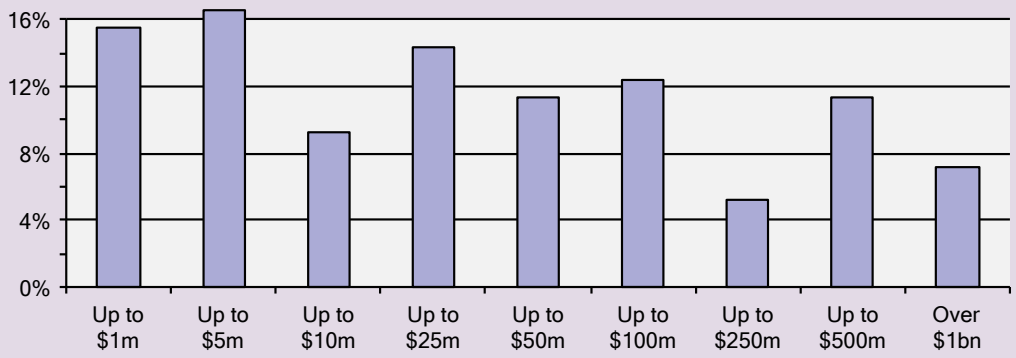
What type of companies do you put in the programme?



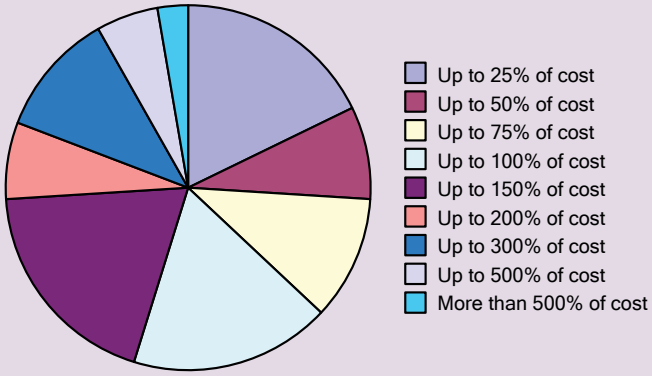
Where do you prefer to source early-stage entrepreneurs from most regularly?



How much have the graduates of your programme raised from independent VCs?



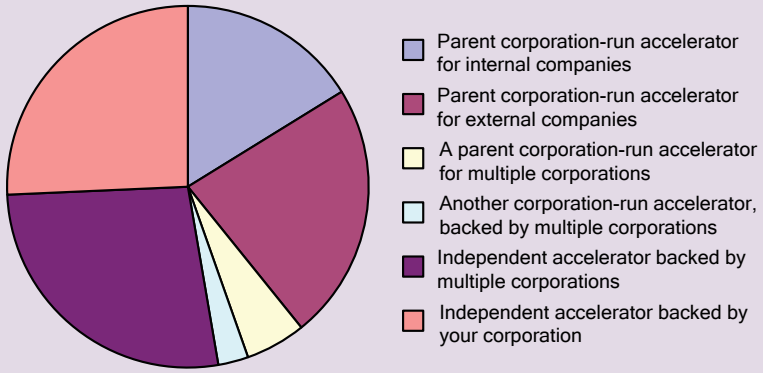
What is the net asset value of your early-stage portfolio?



of those contributing to the report have secured more than $500m in VC funding, while 19.2% have made a net asset value return of three times or greater. However, 51.3% have portfolio companies that have raised less than $10m, and 37% have a portfolio valued below cost.

Early-stage investors generally tend to pick businesses to discern their business model, with 65.2% looking at companies at pre-product or revenue stage, while only 25.9% look for profitable companies. However, only 28.6% accept executives only, generally expecting a company to have been formed.

What is the structure of your early-stage programme?

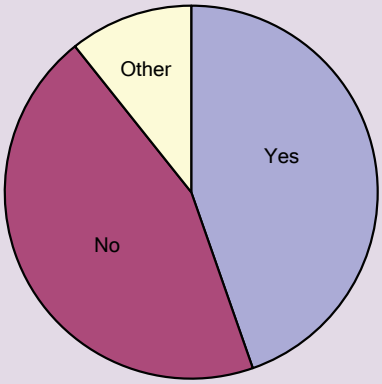


There are various ways in which corporations run their accelerators – 44.6% run the accelerator themselves in some way, while the remainder look to independents to manage them.

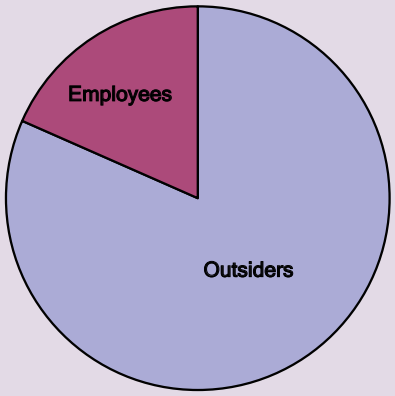
There are multiple metrics early-stage investors use to measure their success, with 63.4% tracking their portfolio exits and survival rate, while 62.5% track startup valuations, 48.2% track partnership with the parent corporate, and 46.4% track revenue of the portfolio. Perhaps in reflection of the fast-changing composition of early-stage startups, only 20.5% track portfolio company team sizes.

Are your return goals strategic or financial?

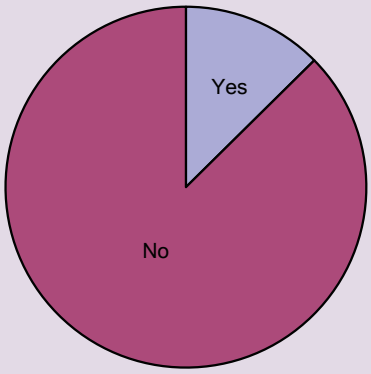
Do you have a corporate venture arm?



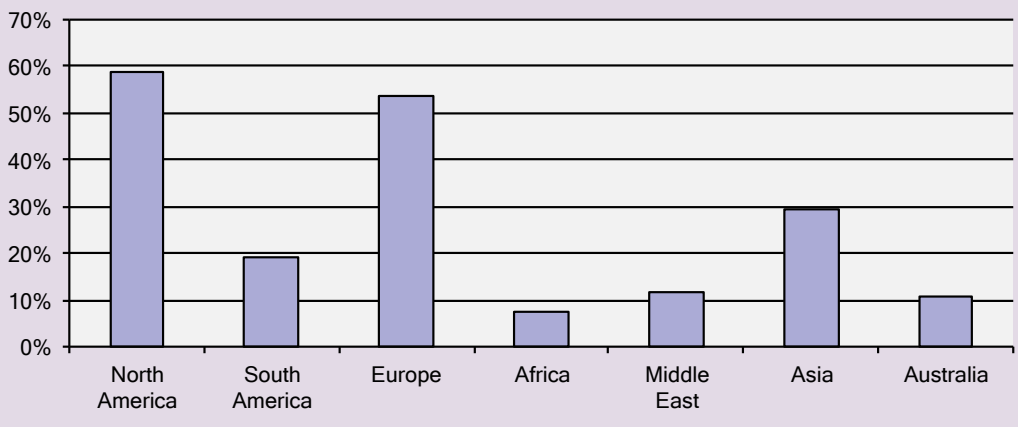
Is the programme open to outsiders or only to company employees?



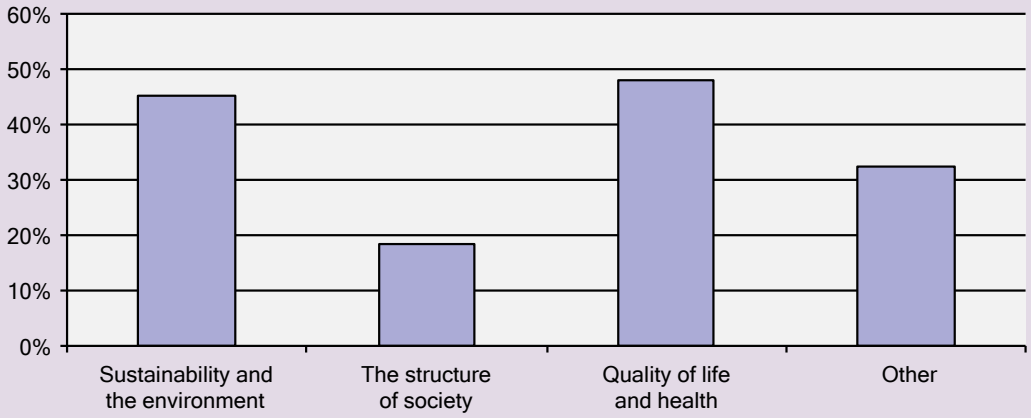
If open to outsiders, do they need to be using your company's technology in order to qualify?



In which regions do you operate your programme?

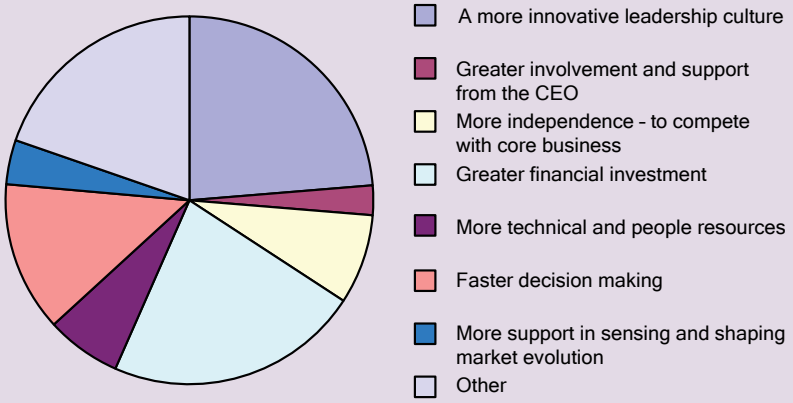


Does your accelerator look to tackle any of these broader themes?



There is a divide between those taking equity and those looking simply to foster the startup ecosystem, with only 22.8% offering soft benefits like such as mentoring or co-working, but 51.8% are investing more than $100,000 in portfolio companies.

Which of these would you like most from your parent company?



Perhaps unsurprisingly, early-stage participants are generally looking for a return but also for wider outcomes, with 60% looking to achieve both strategic and financial goals.

A decent number of those involved at the early stage also invest at the later stage, with 44.6% of groups active at early stage also having a corporate venturing unit.

The trend is generally to deal with external businesses, with 81.6% opening up the cohort to those outside their company. At the same time most are not forcing collaboration with their parent, with only 12.6% mandating that those taking part must use their company technology.

There is a varied geographic spread, with 58.9% active in the US, 53.7% in Europe, 29.5% in Asia, 18.9% in South America, 11.6% in the Middle East, 10.5% in Australia and 7.4% in Africa.

Many are motivated by wider societal impact, with 47.9% of groups tackling quality of life and health themes, while 45.1% are interested in sustainability and the environment.

The hottest issues are securing the right kind of support from parents. Nearly a quarter of groups (23.7%) would like a more innovative leadership culture from their parent, while 22.4% would like greater financial investment.

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The **Global Corporate Venturing Academy (GCV Academy)** supports executives, corporates and partners, to enhance their understanding of corporate venturing, and develop their capabilities to deliver strategic and financial benefits to their organizations and to society.

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Date	Program Name	Location	Price
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30 Jun-1 Jul	Corporate Venturing 2-Day Program	London	£2495
2 Jul	Masters Program: Board Roles as CVC	London	£1300
8-9 Jul	Corporate Venturing 2-Day Program	Silicon Valley	$3495
10 Jul	Masters Program: Board Roles as CVC	Silicon Valley	$1950
17-18 Sept	Corporate Venturing 2-Day Program	Shanghai	£2330
30 Sept	Masters Program: Impact Investing	London	£1300
15-16 Oct	Corporate Venturing 2-Day Program	Silicon Valley	$3495
17 Oct	Masters Program: Board Roles As A CVC	Silicon Valley	$1950
20 Oct	Masters Program: Investment & VC Partnering	San Francisco	$1950
17-18 Nov	Corporate Venturing 2-Day Program	London	£2495
19 Nov	Masters Program: Board Roles as CVC	London	£1300

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Masters Program: Intellectual Assets & Partnering

An important aspect of innovation and venturing is the creation and exploiting of intellectual assets, and it's key that organizations can partner and work with other people. Gain an understanding of different intellectual assets, the range of partners in the process, approaches to documenting IP, potential pitfalls and deal structuring.

Masters Program: Board Roles As A CVC

Participating with start-ups as a board member, board observer or advisor provides advantages in gaining technology and business model insights, but a role on the board has important implications for individual and corporate responsibilities and risks. Find out about key responsibilities, fiduciary duties, legal differences across jurisdictions, and how to manage a range of scenarios.

Masters Program: Investment & VC Partnering

With the Investment & VC Partnering program, executives gain insights to the approach to direct investing, investing alongside VCs, and partnering with VCs and incubators. Share perspectives with top executives, executives running corporate venturing units and peers from other leading organizations on deal structuring, building an effective deal flow, and working with investors.

Masters Program: Impact Investing

This Impact Investing program considers the different investment approaches for venturing in sustainable solutions in developing countries, frugal innovation and venturing at the 'base of the pyramid'. Learn about key macro-economic trends, how to develop effective partnerships with like-minded investors and how to work alongside multiple stakeholder groups, such as foundations and NGOs.

Sourcing innovation from the ivory tower

By Kaloyan Andonov, reporter

"As much as we sometimes roll our eyes at the ivory-tower isolation of universities, they continue to serve as remarkable engines of innovation" – Steven Johnson

There have always been people who consider academia to be a world of its own, detached from the real world. People's perspective and perceptions matter indeed, and all the more so when it comes to venture investment at an early stage. But how do corporate investors really see people from academia? To gain further qualitative insight on the matter beyond the 114 survey respondents' primarily quantitative inputs, six university liaison officers were interviewed in more detail.

These officers represented technology provider IBM, industrial conglomerate General Electric's corporate venturing unit GE Ventures, pharmaceutical companies GlaxoSmithKline and Merck's respective venturing units SR One and MS Ventures, Deutsche Telekom-backed accelerator Hubraum, and the Designer Accelerator, based in California, US.

Investors are open to new and good ideas from anywhere

Raising awareness about entrepreneurship in academia is paramount

Positive trends increasing business orientation, building networks with industry and entrepreneurs as well as co-operation

Challenges remain with expectation discrepancies

Scope

When asked about the type of universities and research centres they look to – whether to source deals, invest in spin-outs, hire students or faculty – all those interviewed unanimously claimed to be generally "agnostic" and "open to new great ideas from anywhere", within the scope of their investment strategy and geographical reach. For IBM, MS Ventures, GE Ventures and SR One there are, in principle, no geographical limits, whereas Hubraum and the Design Accelerator operate in specific regions, the former in central and eastern Europe and Israel, and the latter in Pasadena, California.

While open to ideas from anywhere, the majority of the liaison officers targeted the top-tier academic centres in their respective region or field, such as Oxford, Cambridge, Leiden, KU Leuven, Stanford, University of California Los Angeles (UCLA), Penn State, Caltech, MIT, Warsaw University of Technology, and the Weizmann Institute of Science in Israel.

So while there is a no formal pedigree barrier, being a top-tier institution helps to draw the attention of investors. Matthew Foy, partner at SR One, said VC investors were likely to go first to the "obvious" places where they would expect quality research to be carried out, while remaining open to great marketable ideas from anywhere.

But non-top-tier academic institutions would have to reach out to such investors and be prepared to convince them that their students, research and spin-outs are indeed worth attention, time and resources.

These potential investment opportunities could be very early-stage for those who invest actively. Foy said in the case of drug discovery and development, it could be as early as having an idea on paper.

Edward Kliphuis, associate at MS Ventures, agreed and added the execution and business side of the project had to be covered properly beforehand.

Faisal Syud, vice-president of strategic growth programmes at GE Ventures, said: "GE Ventures has started to engage with academic centres in developing business plans and spin-outs. GE Ventures has also started working much more closely with accelerators towards generating proof of concepts together."

Mark Goodstein, managing partner at the Design Accelerator, said he would work with anyone with a great and potentially marketable idea as it was still in an initial stage of development, adding that Design Accelerator tries to draw and grow as many opportunities as possible through coaching and mentoring, eventually to invest in the best of them.

Luka Sučić, business development manager at Hubraum in Poland, said the accelerator invested in all types of opportunities, even before a proof of concept.

James Spohrer, director of global university programmes at IBM, said early-stage investment went through the various platforms run by IBM, such as the $100,000 in seed funding provided in January to a group of student entrepreneurs from University of Texas at Austin to launch their Watson app for social and citizen services.

University evaluation criteria

Openness and willingness to adapt to the business world are the two most important factors in corporations' university liaison officers perceiving a university as better or worse than its peers.

Foy said openness was about the spirit of collaboration being encouraged both internally and across institutions – the idea of coming together and sharing ideas. "This type of culture elicits more good ideas among scientists and investors."

And he called on academic institutions to take a proactive approach to building bridges to industry and entrepreneurs, as they could "accelerate the academics' thinking and guide them towards what is a good idea, as opposed to what has been just an interesting piece of science".

Kliphuis said MS Ventures encouraged the move away from conducting research for the sake of

research, aiming more at commercialising it as a final product.

Sučić said Hubraum placed emphasis on the importance of practical orientation of universities. "Theory is essential but, without experimenting and trying it in practice, there is a big portion of potential being lost." Therefore, any "university that has courses, labs or puts any kind of emphasis on practical experience during studies is perceived much better" than those that were purely focused on theory.

Goodstein said good universities, such as Caltech, Stanford and UCLA, all in California, helped investors know and understand better their internal processes related to innovation.

Spohrer said there were "many ways to grow win-win relationships with IBM". He identified six ways for higher education institutions to stand out in their relationship with IBM – research (faculty collaborations), readiness (skills on IBM platforms), recruiting (both full-time and interns), revenue (purchase of enterprise solutions from IBM), responsibility (IBM adjunct faculty and guest lectures), and regions (startups on IBM platforms). These are open to all academic institutions, from community colleges to top research universities.

Syad said: "What makes a university a better partner than its peers is its willingness to work with GE and try to develop new business models."

He added it was better helping "to explore and discover what could be of value versus working to secure ownership even before proof of concepts".

Common challenges – an expectation mismatch

For Kliphuis, the greatest challenge in dealing with universities related to expectations, such as unwillingness by the institutions to share the risk involved in an early-stage undertakings, lack of alignment on commitment to the startup or spin-out project, or high and unrealistic expectations in terms of subsequent financing rounds. For universities, the challenge in dealing with corporations was to find those that were, as Tom Hockaday, head of Isis Innovations, Oxford's commercialisation unit, put it, actually "allocating resources to engage with open innovation". For investors, there may be a discrepancy concerning the business side of developing a startup project.

Technology transfer offices (TTOs) have picked up part of the responsibility for these expectation gaps. One of those interviewed said: "There is quite a large spectrum of tech transfer offices and they can either be perceived as facilitators or as a barrier to innovation. I have spoken to other investors who would say: 'I will never go back to investing in a company coming out of that university no matter how great the science is.' And some of these are top-tier names and institutions."

Another interviewee said: "It tends to be a tough exercise to try to find something that is actually good through TTOs. And I am not sure why that is. I wish I could pinpoint it, then we could definitely change it."

Another added: "It is hard to make a generalisation. It is more on a case-by-case basis. Some universities are really good, others are bad. There are many that are bad. Caltech is among the best. They patent everything and have a very well-functioning TTO, whose staff are all members of patent bars and PhDs. They can both speak to research scientists and understand the market at the same time."

Internal reasons at TTOs could be a determining factor, some said. In some universities in Europe, "either the teams are too small or the people are not professional enough, so it is tough to get quality research".

Another liaison officer attributed the issue to differences in incentives and university policies. "They

There is quite a large spectrum of tech transfer offices and they can either be perceived as facilitators or as a barrier to innovation ... and some of these are top-tier names and institutions

have a right to the intellectual property and do not seem to think their job is to make it easy for entrepreneurs and investors. They prefer licensing technologies to large companies."

He also points out how a TTO could be an obstacle not only for investors but also for entrepreneurs on campus. "What happens is that only big-time research professors who go to the TTO get their invention or idea patented, whereas assistant professors without tenure do not. And that is horrible."

Part of the issue historically has been funding. In 2009, an academic paper – How are US technology transfer offices tasked and motivated: is it all about the money? – found that the Bayh-Dole Act, which allows US universities to patent federally-funded inventions, had been "an unfunded mandate on academic institutions", as more than half the TTOs brought in less money than the costs of operating them and, on average, universities spent 0.6% of their research budgets on technology transfers.

The paper concluded the majority of TTOs were not properly tasked and motivated, with fewer than 10% of them motivated by reaping financial returns.

A 2012 paper – Keys to the kingdom, published in Nature magazine by collaborators of the Oxbridge Roundtable – said TTO issues were best tackled by being "fully informed before initiating negotiations" and attempted to provide guidelines for investors and entrepreneurs. Negotiations with TTOs, according to the paper, would often be stymied for a number of reasons, including information asymmetries in negotiations – not knowing how to set and bargain fair market terms – lack of business experience in the founding team, lack of funding, restrictive conflict-of-interest policies and lack of access to experienced legal counsel as well as drawn-out licensing processes.

But corporations are also looking beyond TTOs for talented people and their ideas.

Targeting students

Sučić said Hubraum was involved in various programmes at a junior and senior level for universities. "At certain times we focus on junior students while they are on campus, and help them and their ideas reach a certain maturity by mentoring, or supporting in different ways, such as organising hackathons, business modelling workshops, hardware pitch trainings. Sometimes we would target post-grads and their master or PhD thesis, helping them shape it into a product, or at least concept, and help them commercialise it in one way or another."

From the epicentre of the technology industry in Silicon Valley, California, Spohrer stressed the importance of the "cognitive sport" trend in academia. "From high school to higher education, more and more of these competitions are combining engineering, business, as well as liberal arts and social sciences into new ventures and startups."

Such competitions and initiatives not only raise awareness among students and people in academia but, ultimately, also "encourage entrepreneurs to make a job, not just take a job".

IBM has launched two initiatives, Smarter Cities Challenge and IBM Smart Camp, to foster and promote entrepreneurship. SR One, in collaboration with the Oxbridge Roundtable and a handful of other corporations, has set up the OneStart accelerator programme targeting people under 35 with marketable ideas or startups in the field of biotechnology.

GE has sponsored the GE/NFL Head Health Challenge I and II, focused on a specific issue, brain trauma, while others are broader.

Trends in academia

Corporations' academic liaison officers have been observing similar trends, such as increasing openness to the world of entrepreneurship and commercialising ideas in the market, taking place in

universities in Europe and North America.

Kliphuis summed it up as "increasing business savviness" following growing pressure for academic institutions to reorientate their missions and make a larger and practical contribution to social and economic welfare.

The EU's latest seven-year budget, Horizon 2020, allocates about €69bn ($77bn) to innovation, with university-business links a focus area. This follows in the footsteps of the Lisbon Agenda, established in 2000, when European leaders committed the EU to become by 2010 "the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment".

Boosting the "the knowledge society: increasing Europe's attractiveness for researchers and scientists, making research and development (R&D) a top priority and promoting the use of information and communication technologies" was the first of five policy actions recommended by the Lisbon Agenda as its mid-term review continued to worry that "Europe faces a twin challenge from Asia and the US".

US and other institutions of higher learning around the world are also under a similar imperative to focus on research and its development.

Foy said the "culture shift" meant there had been changes in channelling funding to academia. He said in a grant application there was a now noticeable change relative to the situation 20 years ago. Funding had shifted "meaningfully towards research that could be of use and potentially translate into technologies that ultimately help patients". An academic researcher with an idea that has relevance in curing a disease was more likely to receive funding than one whose idea pertained to the realm of hard or abstract science, he added.

Foy also observed an increasing willingness to collaborate across institutions and "leverage capabilities outside an academic's own lab", particularly in the field of drug discovery and development, facilitated by academics' ability to reach out to their colleagues working on similar problems rather than being bound to reading hard copies of research papers.

This connectivity avoids duplication in R&D, which Foy said was important in pharmacology, "whether it is analytics, models or even access to patients".

Industry trends

Changes in the economy affect corporations' university liaison officers. In computer technology, Spohrer said IBM had embraced the internet of things (IoT) by setting up a foundation and would "support many startups from universities" in the area. IBM has pledged to invest more than $3bn over the next decade to establish an IoT unit.

In health, ubiquitous internet connectivity, mobile devices and wearables have been cautiously approached by drugs groups. Foy said before investing he would want to see "some early-stage adoption, for example a regional trial" rather than just an idea in an academic paper. This was because in biotech the underlying technology is protected by patents and an idea with promise could be protected, whereas electronic or mobile health – e-health and m-health – required more steps before patenting.

Similarly, Kliphuis said MS Ventures also had concerns about e-health and m-health but had already invested in one startup in the field and could make other investments in the short and medium term.

Corporate accelerators: a strategy for success

By Amy King, reporter

When the global recession hit in 2008, many corporate purse strings tightened. But though some businesses may have been tempted to cut back research and development (R&D) expenditure, others sought alternative, potentially more cost-effective means to increase innovation rates through setting up corporate incubators and accelerators, including Disney, Barclays, Telefónica and Red Bull.

Accelerators are increasing their startup impact through corporate backing

The rapid growth in numbers is raising questions of results and sustainability

According to last year's report by Spain-based phone operator Telefónica's accelerator Wayra, corporate incubators and accelerators accounted for 12% of UK total startup programmes. These corporate accelerators are following the rapid growth in independent accelerators, many of which are courting relationships with business to boost their cohorts of startups.

Last year's paper, Accelerating startups: the seed accelerator phenomenon, by academics Susan Cohen and Yael Hochberg, identified the first accelerator as Y Combinator, founded by Paul Graham in 2005.

Nine years later the academics noted estimates of the number of accelerators ranged from 300 to more than 2,000, spanning six continents, and the number is growing rapidly. The Global Accelerator Network, a selective international umbrella organisation for accelerator programmes that follow the Techstars model developed in 2007 by David Cohen and Brad Feld, two startup investors, counted 50 accelerators in 63 cities among its members.

Techstars' first corporate partnership was with software provider Microsoft in 2011 and focused specifically on Kinect – motion sensing input devices for Xbox and computer – but others include media group Disney.

Dave Drach, vice-president of partnerships at Techstars, said: "Disney has a huge amount of marketable intellectual property with characters from the historic Disney franchise, from Pixar, Star Wars, Marvel, the Muppets, ABC content and ESPN content. Disney needed new ways to engage people around this content and monetise around that engagement. They tried different programmes, but the Disney Accelerator, powered by Techstars, has proven very effective."

Drach said robotics company Sphero developed the new robot, BB-8, at the accelerator for the forthcoming Star Wars film.

But while the number of accelerators has been growing rapidly, questions remain about whether accelerators create or select for success? Christopher Haley, head of new technology and startup research at UK-based innovation charity Nesta, said: "There is a big question mark around accelerator programmes in general. Do they work? There is not yet quite enough evidence to point at what works and what does not," even if some accelerator graduates, such as room reservation service Airbnb, a graduate of Y Combinator, have been successful.

The goal is to increase sales. When they start to be successful and sell their solutions, which includes our technologies embedded in it, it is a win-win

Haley added: "The second question is the signalling effect of having been through one of these courses. There is undoubtedly a benefit in saying you are a graduate of Y Combinator as it will be a little bit easier to get a meeting with a venture capitalist."

While accelerator motivations are clear-cut, as they usually take equity in their cohorts or fees for providing services or space, the motivations can be less obvious for corporate-backed accelerators. They can be viewed as a channel of open innovation to support in-house R&D, a way to grow the market for a proprietary product or a means to create an ecosystem, or just part of a public relations or corporate social responsibility (CSR) campaign, financed through a marketing budget.

Haley was concerned about the latter. "The danger of funding this from a marketing or CSR budget is that the activities can be insufficiently aligned with corporate strategy, and fail to get the necessary internal buy-in."

To help align their innovation strategy with startups, corporations are looking to select from a broad range of open innovation and corporate venturing tools.

Tracy Isacke, managing director of corporate relationship management, and Claire Lee, head of early-stage banking at Silicon Valley Bank, said the financial services group created a four-month, virtual accelerator programme, Commerce.Innovated, in 2014 by partnering credit card provider MasterCard "to leverage the massive growth in fin-tech [financial technology] innovation".

Another trend followed by SVB is corporations building deeper ties with universities. Isacke and Lee said: "This has long been a useful way to keep a finger on the pulse of innovation. In today's world of startups, that relationship plays itself out in different ways."

They said that in January SVB brought 18 students of mixed entrepreneurial experience from 10 US universities "to Silicon Valley for a first-hand view of the entrepreneurs' world". They added: "This was the bank's first attempt at immersion for a group of students pursuing diverse degrees at a time in their life when they could really benefit from meeting top entrepreneurs and venture capitalists."

Dror Pearl, head of the IBM's Global Technology Unit, said it had set up first accelerator – IBM Alpha Zone Accelerator – in Israel in April last year. "In the past three years, we have seen more and more accelerators and incubators open their gates to invite Israeli startups to work with them.

"Whether we needed an accelerator or not was not a tough decision – if the market is there we must establish one. But unlike others, we decided to be completely different and focus on A-round companies and beyond. We want to take the more mature companies, bring them to the enterprise markets and help them to sell globally."

IBM requests in return that its startup participants check whether IBM's technology can be used to help in their products or services. Pearl said: "The goal is to increase sales. When they start to be successful and sell their solutions, which includes our technologies embedded in it, it is a win-win."

And the limited evidence so far suggests some corporate accelerators can be helpful to themselves and the entrepreneurs. Wayra's report includes data from three corporate accelerators in London, UK, that reveals a survival rate of 90.1% among its graduates.

Wayra itself was established in 2011 by Telefónica, which needed a way to remain competitive as its market was disrupted by startups and its domestic Spanish market was hit by the global financial crisis. Wayra's academies in both Barcelona and Madrid have helped Spanish startups raise more than $13m over the past 18 months.

Until Wayra's launch, the company's approach to startups had been somewhat limited, having made some "very expensive acquisitions" over the years, according to Gary Stewart, director at Wayra in the

UK and formerly launch executive in Spain from 2011.

Stewart added: "Wayra was created to help Telefónica in its transition to a digital telco, because we saw companies like WhatsApp were eating into our SMS business, and Skype was eating into the roaming business. Working with startups gives Telefónica more of a preview as to what the future might look like."

Now Wayra operates 14 accelerators across 12 countries with a notable presence in Latin America. In the UK alone it accelerates cohorts of 20 businesses in which Telefónica invests as a minority shareholder, as well as cohorts of 10 social ventures in which Telefónica and the UK government invest as minority shareholders through Wayra UnLtd.

However, given competition and other factors, other locations have been less successful. Wayra's Prague outpost in the Czech Republic was recently closed, and the future of its Dublin presence remains uncertain, while the group is also exploring the possibility of opening further spaces in partnership with other telcos.

In March, Wayra launched an entrepreneurship alliance with Korea Telecom and the South Korean government, and it has a similar initiative in China.

The development of alliances with competing international telcos points to the often multiple and occasionally conflicting rationales behind corporate backing of accelerators. Stewart said: "I have spoken to all the other telcos, like Orange. If one of them can help to do a pilot for our startups, or they want to invest, well that is not something we view negatively.

"To be clear, I have two key performance indicators. The first is to see if I can help startups raise financing. The second is to see how I can help them to scale. Telefónica is the first and most obvious channel to pursue, but we are also open to working with other corporates that might be potential clients and distribution channels for our startups. In fact, on various occasions we have invited other corporates like Turk Telekom and Santander to sit on our judging panels so that our startups might have greater access to other markets.

"The impression I have is that telcos are more concerned about companies like Apple, Facebook and Google, which are launching mobile plays without any sort of regulation, than they are about each other."

Last year, companies accelerated at Wayra UK had 27 trials with Telefónica, with seven gaining contracts, including Qudini, a queue management system for phones used by O2, Telefónica's commercial brand in the UK. Qudini is expected to close a funding of more than £1m ($1.5m), with reinvestment from Wayra.

While significant for Quidini, for Telefónica it is virtually a rounding error for a company that is part of a select group of companies that invest more than €1bn ($1.2bn) a year in R&D or has dealt with acquisitions worth hundreds of millions or billions of euros.

The greater impact could come if Telefónica and the other corporations with accelerators can deliver better service to customers or insights into their needs that can be met in different ways and by accelerating the results from product development.

Partnerships between universities and business

By Janet Corzo, associate, Perkins Eastman

Partnerships between universities and businesses are nothing new in the US, but these partnerships have become especially relevant in the face of increasing economic pressure and global competition, the need for interdisciplinary approaches and the growing complexity of the problems need solutions.

In recent years, there has been a resurgence of partnering between academic institutions and private industry that is poised to address many of the modern challenges to advancing research, innovation and technological development.

Historical perspective

Academic research institutions and private industry share a rich history of collaboration dating from the early 20th century. One of the earliest examples, a joint research and development (R&D) effort between professors at Massachusetts Institute of Technology (MIT) and Standard Oil of New Jersey, resulted in a technological advance in petroleum refinery. During World War II, the US government invested heavily in research aimed at national defence, establishing the centralised national lab system that brought together top academic and industry researchers. This convergence led to technological breakthroughs that would drive innovation for years to come.

After the war, universities relied on abundant federal research funding, while private industry moved towards a centralised R&D model – notable examples include Bell Labs, IBM and Xerox Parc. Although research efforts became bifurcated, there was often overlap during this time with academic researchers making key contributions to technologies emerging from corporate labs.

The US Bayh-Dole Act of 1980, passed in response to the economic stagnation of the 1970s, was instrumental in altering the landscape of academic research by giving universities greater control over patents and intellectual property, resulting in the proliferation of technology transfer offices at research universities that were established to capitalise on research.

Funding challenges today

Academic-industry partnerships are becoming increasingly robust and collaborative as a result of growing economic volatility, competition from emerging economies and a rapidly evolving technological landscape that has changed the way people work, exchange information and conduct research.

Public funding for academic research has declined in recent years, with the majority of research

Academic institutions are well-equipped for facilitating collaboration between traditionally separate disciplines and can serve industry by filling the research gap

dollars skewed toward limited fields of study. These research grants have become difficult to acquire in the face of greater competition and narrowing focus. Additionally, public universities are experiencing cutbacks in research funding due to fiscal policy at the state level.

Meanwhile, private businesses are facing increased pressure to do more with fewer resources. Many industries have shifted focus from investing in long-term, discovery-based R&D efforts toward shorter-term strategies that identify and target consumer needs and trends. In the face of shrinking R&D budgets, large centralised R&D facilities have become financially unsustainable. Yet innovation remains necessary. While incremental technological improvements sustain short-term product cycles, it will be the scientific discoveries and technological breakthroughs that address society's greatest needs.

Although the research motivations of universities and private industry are traditionally at odds with each other – university research as a contribution to a public body of knowledge versus corporate profit-driven applied research – universities have become more entrepreneurial while industry is realising the potential for academic expertise centres to fill the need for applied research. Emerging areas of study are becoming progressively interdisciplinary, encompassing the traditional sciences, engineering, medicine, computer science and social sciences.

Academic institutions are well-equipped for facilitating collaboration between traditionally separate disciplines and can serve industry by filling the research gap. Many have created hybrid degree programmes that address the growing need researchers and professionals have for interdisciplinary skills. In its 2013 publication Research Universities and the Future of America, the National Research Council cites "strengthening partnerships with business" as one of the 10 recommendations universities can follow to remain globally competitive and overcome economic pressure.

Partnership models

Since the passage of the Bayh-Dole Act, university-industry partnerships have consisted largely of transaction-based partnership models through technology transfer offices. This model, which can range from contract research work to licensing patents, carries minimal risk for both parties, but results in little revenue for the university and typically does not lead to groundbreaking innovation on the corporate side. However, the value in this model lies in the ability for transaction-based research-for-hire to evolve into a long-term partnership as mutual trust is built between parties over time.

Academic research has been trending toward fostering interdisciplinary research and collaboration outside the lab, resulting in buildings with increasingly generic wet lab space supported by highly flexible non-lab workspaces that support various modes of working, as well as highly specialised core facilities based around a specific technology or field of study that are typically shared by multiple

departments and across disciplines. These state-of-the-art facilities can be leveraged to attract private industry for a wide range of partnership models – from transaction-based partnerships to long-term, focused research collaborations.

Business incubator programmes are ideal for mid to long-term partnerships that reach beyond the technology transfer office. This partnership model is also an effective springboard for startup or spin-off companies that result directly from in-house research, allowing the new business to maintain a link with the university as it matures. Providing a residence for businesses within the academic campus allows industry professionals to become embedded in the research setting with access to labs and equipment, while giving researchers and students direct access to industry professionals, building a network of knowledge and collaboration that is mutually beneficial.

Keys to success

The success of any partnership depends largely on several key factors that are cited again and again by numerous sources, including a 2008 report by the President's Council of Advisers on Science and Technology and a separate three-year MIT study:

- Develop a shared vision that clearly identifies the purpose and goals of the partnership and provides a framework for all involved parties to follow.
- Identify leaders who are capable of crossing boundaries between business and academia to foster strong ties between parties.
- Erode boundaries between entities by facilitating communication. Create a shared platform for the exchange of ideas and information.
- Establish a clear agreement for the use of resultant intellectual property. This remains one of the biggest hurdles to overcome for the success of a partnership. All parties can maximise the benefit of the partnership by agreeing to a shared set of expectations that are well-defined and transparent.
- Invest in long-term relationships. A long-term relationship allows parties to share risk and accountability without overburdening a single entity. Under a shared vision and a foundation of mutual trust, a long-term partnership can reap great results by building a body of work over time.

Long-term strategic alliances, focused around a specific area of study, carry the greatest risk but have the greatest potential for impact. The opportunity exists for academic institutions to partner private industry at a variety of scales, including large corporations, small businesses and non-profit organisations, as well as government agencies under a consortium of parties that share common goals. This model has inherent efficiencies, creating transparency between entities, pooling resources, breaking down barriers to intellectual property rights and streamlining the process of bringing research results from bench top to market.

The physical setting for a large-scale research effort involving many parties can vary from multiple concurrent settings that include university labs, corporate centres and national labs to a single dedicated research campus community. The partnership model creates a framework for the rapid and open exchange of information between parties with a shared vision and goals.

The success of the open-source concept of development in computer science has led to its adoption in other fields as a tool that can be leveraged by both academic institutions and private industry to partner each other in new ways. Open-source research models have the potential to democratise innovation and discovery by linking academia, industry, government agencies, philanthropic organisations, non-government organisations, private investors and individuals across the globe.

Integrating internet-based concepts such as crowdsourcing and crowdfunding can serve to expand the reach and impact of research. For example, the drug industry is currently experimenting with open-source research networks to facilitate drug discovery. One such network, Open Source Drug Discovery, based in India, has brought together more than 7,000 participants to research and develop drugs for neglected tropical diseases, including tuberculosis and malaria.

Can corporate innovation ride the accelerator wave?

By John McIntyre,
managing director, Citrix Startup Accelerator

We have all seen the problem – a successful company has a market-dominating product that for years has provided it with fat margins and the ability to dictate terms to industry players and customers. Then, seemingly overnight, it wakes up to find the rules of engagement have been altered by a startup that has disrupted its industry. Suddenly, put on the defensive and with no new products in the pipeline, growth declines and once-healthy margins dwindle. What happened to this company? Was management asleep at the switch?

Many times, it can take years for a company to lose its market position and see its growth and profitability progressively slide. But the market dynamic seems to change instantly. In a conversation I had with an executive from a highly successful mobile handset provider, I was told that his company saw the iPhone coming years before it launched. Despite this foreknowledge, his company still lost its entire market.

Numerous similar examples exist from the past 20 years. In his 1997 book The Innovator's Dilemma, Clay Christensen highlights the phenomenon. "Precisely because these firms listened to their customers, invested aggressively in new technologies that would provide their customers more and better products of the sort they wanted, and because they carefully studied market trends and systematically allocated investment capital to innovations that promised the best returns, they lost their positions of leadership." What, then, is a company to do to stay on its game?

Corporate venture and development groups have been working closely with startups for many years to invest in and acquire them. This practice, by which large companies grow and startups exit, is a critical aspect of the ecosystem. These types of programmes are necessary, but not sufficient. Valuations for successful startups are sky high and, even when they are acquired, integrating them successfully into an existing company is, at best, a 50:50 proposition.

Over the past five years, we have seen a burst of activity around corporate innovation programmes. There are many approaches, but all such programmes have the objective of keeping corporations growing. An emphasis is placed on organically grown internal products or innovation funds for early-stage startup investments. This can be viewed as a third leg of the corporate growth strategy, hedging a company's bet against being blind-sided by a new startup. These programmes are well-intentioned but solid results are hard to come by.

In parallel, more than 300 accelerator programmes are currently operating in the US alone and we are now seeing these two forces converge – corporate innovation plus accelerator means and methods. A common question I am asked is: what are the results and how do we measure success in the short term, as it can take many years to see final outcomes?

Accelerator programmes, unlike corporate incubators of old, bring with them mentors, access to key technologies, customers and funding. The success of independent accelerators such as Y Combinator, Techstars and 500 Startups has shown that the cohort and mentor model can help startups find market traction more efficiently. Can that also work in a corporate context and with internal startups – intrapreneurs?

As the managing director of the Citrix Startup Accelerator for the past four years, I often field these questions, along with operational inquiries. As one of the early corporate-run startup accelerator programmes, we have experimented with different approaches to mentors, technical support, design feedback, customer development and access to later-stage capital. We currently run a seed-fund programme and a three-month Innovators Programme, with global partners to extend our open innovation platform. We have both entrepreneur and intrapreneur teams in the same cohorts, so we are breaking some new ground in corporate innovation approaches.

Now, as part of the Kauffman Fellows, a training programme for venture investors, I too want to ask these same questions across multiple companies and industries to understand what is working and what is not.

The Kauffman Fellows has partnered Global Corporate Venturing and Prof Yael Hochberg to conduct a survey, which will begin to track and answer questions around the effectiveness of accelerator-style programmes and corporate innovation.

In the coming months we will take this survey information and go deeper with interviews of corporate programmes to get a better sense of what milestones are being set up and what results are expected. Over the next several years, the Kauffman Fellows special interest group on accelerators and corporate innovation will continue to track these programmes and report on actual outcomes to determine what works and what does not.

Unpacking the world of accelerators

By Andy Shannon,
global head of operations, Startupbootcamp Global

It seems that lately many cynical voices in the startup world are not-so-subtly denouncing the role accelerators play in developing companies. Suddenly, in their eyes, there are almost as many accelerators as there are startups.

Yet despite this criticism, the positive impact accelerators have on ambitious startups is evident in the powerful relationship-building opportunities and coaching insights top programmes offer founders. To truly understand and locate accelerators within the greater startup landscape, it is helpful to consider their history and the different forms they can take.

A brief history of startup accelerators

The startup accelerators we see today are an evolution of business incubators first seen in the late 1950s. From this initial workspace-focused model, accelerators emerged in the mid-2000s with the explicit goal of creating a nurturing, mentor-driven environment where startups would thrive. Ideally this supportive community increased the likelihood of a startup finding its secret sauce and gaining rapid growth.

Today, most accelerators are composed of three to four-month programmes where selected startups – usually eight to 12 per class – are rapidly exposed to a talented and diverse network, from mentors to partners. Accelerators also often provide seed funding, free office space, access to technology and other perks – all activities designed to support a startup's rapid growth.

Different accelerator models

Accelerators have traditionally been founded by angel investors interested in supporting local startup communities or diversifying their investments. Yet recently there has been an explosion of alternative accelerator models, including corporates looking to capitalise on startup talent, governments interested in attracting technical talent, and dynamic multi-programme ecosystems giving startups a route into a global network.

Corporate accelerators: Large corporates are a significant entrant into the accelerator industry. Some of the world's leading brands are increasingly taking an active role in fostering innovation by supporting startups.

Many companies, including Google Ventures, Telefónica's Wayra, and Orange Fab, run stand-alone accelerators themselves, acting as both mentors and operators. While this model leverages

The positive impact accelerators have on ambitious startups is evident in the powerful relationship-building opportunities and coaching insights top programmes offer founders

company's existing resources, it can initially be difficult to run quality operations and recruit top startups.

Techstars and others have popularised the "powered by" model, in which a company outsources operations to an existing accelerator. This approach – adopted by Disney and Barclays – shares many of the benefits and drawbacks of stand-alone corporate accelerators while adding value with experienced professionals running quality operations from the start. In this framework, it is vital to align outcomes and expectations across organisations.

Government funded accelerator programmes: Governments have also entered the accelerator space as a way to stimulate growth and nurture innovation. Many have prioritised creating and funding accelerator programmes both to support local entrepreneurs and to attract foreign startups.

The Nordic Innovation House, for example, plays a large role in helping startups raise funding. This jointly funded, hands-on programme supports Nordic entrepreneurs across the region who are looking to access funding and growth opportunities in Silicon Valley. Similarly, the UK government runs the Future Fifty accelerator, which directly connects later-stage startups with domestic and overseas capital.

Despite the unique access government accelerators provide, startups may find it difficult to form meaningful and lasting relationships with these resources. Since startups often do not provide equity to enter government-backed accelerators, a lack of buy-in can make attracting quality programme operators challenging. Similarly, government accelerators are typically limited to supporting startups that meet tight eligibility criteria, making their resources difficult to access.

Multi-programme accelerators: As the accelerator industry has matured, a small group of accelerators have scaled across the globe by producing their own programmes, forming local partnerships or creating targeted funds.

At Startupbootcamp, we have built a global family of 10 industry-specific programmes in a diverse range of industries including smart transportation and energy in Berlin, financial technology in London, mobile in Copenhagen, high-tech hardware in Eindhoven. Our focus on different industries gives us the ability to provide startups with an individualised and tailored acceleration curriculum.

Our corporate partners serve as mentors, demonstrate their products and support our startups before, during and after the programmes.

Accelerators' impact on startups by facilitating vital connections and building integral growth programmes should not be overlooked. As more budding entrepreneurs decide to create companies, it is even more important for startups to understand the different models and how they can benefit from joining an accelerator.

State support for the early stage

By James Mawson, editor-in-chief

Government involvement helps venture investors

State focus shifting towards ecosystem development

There are several approaches to boosting funding for entrepreneurs – helping the demand side with better business plans through online training or classes, boosting the supply side by creating state-backed funds, or economic autarky through shutting off international investors from the best companies.

Naturally, these points were all raised in the European Commission-sponsored policy conference, boosting investment readiness in Europe, in April in Brussels.

Or there is an approach to building a borderless or virtual ecosystem around learning and openness, speed, transparency, collaboration globally, connecting innovation hotspots and generating exits that can create opportunities to reinvest capital and skills.

After 20-plus years of the former, this second approach is gaining increasing attention from policymakers, albeit from a low base of awareness. The published list of attendees to the event included no obvious hands-on university, government and corporate venturing investors, which one senior official described as a "mistake" in the original consortium behind the event, although angel investors were present.

This change in the mindset is perhaps the most encouraging outcome from the event as the EU's €79bn ($94bn) Horizon 2020 programme has only just started – it runs for seven years to 2020. Ignacio Puente, from the European Commission (EC) unit on SMEs, financial instruments and state aid, part of the Directorate General Research & Innovation, set out the plans in a presentation.

While the consensus at the separate Science Business event held in March in Brussels was, with one or two exceptions, that Horizon 2020 had generally lived up to its promise of making things simpler for scientists, the average odds of getting a Horizon 2020 grant in the first 14 months were 14.5%. In comparison, in the predecessor Framework Programme 7, success rates were around 19% to 22%.

Despite the large budget for Horizon 2020, along with national and regional schemes, Europe remains an ecosystem without critical mass, according to Erik Vermeulen, professor of business and financial law at Tilburg University, in his InvestHorizon presentation, Better practices on strategies, indicators, schemes and tools for investment readiness.

As Vermeulen, who is also senior counsel corporate at Netherlands-based conglomerate Philips International, said after the presentation: "Europe lacks [critical mass] and the US has it, so it makes sense to connect Europe to the US.

"Look at Japan – this is what Tokyo University is doing by taking selected entrepreneurs to the US to meet investors three times a year and encouraging exits to US corporations, such as Google. Or Shapeways, a spin-out of the lifestyle incubator of Royal Philips Electronics, that then relocated to the US after Union Square Ventures and then A16Z invested, but is now back in Eindhoven [its former home in the Netherlands] big time and creating jobs.

"Mass is not just about supply of capital and demand from entrepreneurs but how they know what to look for and where – that is investor readiness, which comes from data, news, social media and transparency and connections for who is on what board or invested in whom. Silicon Valley might be a religion but ideas can be transferred to Europe.

"That the EC's mindset is shifting to understand this latter way is viable is encouraging. Data is not just for researchers but used by investors and entrepreneurs to validate each other."

Role of government

Early-stage experts from around the world were asked in interviews about governments' roles in the ecosystem.

In a keynote speech at the Global Government Venturing Summit in Eindhoven, the Netherlands, in February, Low Teck Seng, chief executive of Singapore's National Research Foundation, summed it up as gross domestic product growth following technology. He said: "It is known that success has to be taken care of properly. That is why research and development spending is so high and education so important to building clusters and an innovation and enterprise ecosystem. That and the rule of law."

Singapore's expectation is the future of manufacturing will require the island to have large local corporations as well as foreign multinationals and startups. This is a scale-up challenge it faces, Low said after his speech.

Yi Jiang, general manager of the Xin Centre at Tsinghua University, said: "The government in China is encouraging tech transfer. Policy is being made to encourage the commercialisation of the university research results, such as to suggest the university grant high percentages, as much as 70%, of the licensing income of patents to its inventors personally, and the other 30% go to the university.

"Changes on the technology transfer in universities are under way. In Tsinghua University, the tech transfer office (TTO) has been reformed and has a new structure, and several of university venturing funds have been established. If this model works, other universities in China could follow Tsinghua's model.

"Changes are being made and the pace is fast. The government will not [be involved] in the details, but it will release the signals and make policies to accelerate the process.

"In China, the intellectual property (IP) developed by the universities is usually recognised as state-owned property [and] the tech transfer and commercialisation processes are highly regulated. Some regulations are quite vague, and you will have difficulties to say it is legal or illegal at some situations. [Therefore] the significant changes we would like to see are on the government policy and regulations side, and [they are] happening now."

Yi added: "I do not think that the Chinese universities and countries are generally savvy at recognising economic opportunities. But since there are large pools of universities and talents, [and] huge domestic markets, there will be many interesting things to see in China and Chinese universities in the next couple of years."

Xin is a collaboration between Israel's Tel Aviv University and China's Tsinghua, and Yi said the partnership was creating opportunities to learn.

"Israel has created huge amounts of high-tech startups in the global economy, it has a unique model and there are historical and cultural reasons [for this].

"But if you see the countries of a similar size as Israel, like Singapore, South Korea and Finland, they have different cultures and models that enable companies to establish and develop to a different scale

The rule should be that the inventor's brain is his asset. Everything else is done due to the university

and time span. Israel is hot in startups, but it is only one model of research, commercialisation and economic development."

David Mendlovic, professor at Tel Aviv University and former chief scientist at Israel's Ministry of Science, added: "The government has an important role for setting expectations. It is helpful to have a clear national policy at least for the public institutes like universities [and] hospitals."

And while Mendlovic said Israel had an "acceptable" model even if the government did not offer any or suitable assistance to corporations that want to liaise or work with universities' commercialisation efforts, he said the government "needs to provide better solution for cases when the inventor agrees to take an active role in the commercialisation process".

He added: "In such cases the inventor should get more. Another difficulty is to examine what is service invention and what is a result of advising action. Also it is important for defining student participation and use of other resources. The rule should be that the inventor's brain is his asset. Everything else is done due to the university. I encourage [entrepreneurs] to make an IP agreement *before* [his emphasis] any interaction with the outer world."

Through the recommendation of another former chief scientist, Yigal Erlich, Israel had set up the Yozma programme in 1993 to encourage the creation of its venture capital industry by setting up 10 drop-down funds, each capitalised with more than $20m.

Other countries are increasing their activity. Evgeniya Fedorova, head of Innovation Infrastructure at Ural Federal University (UrFU) in Russia, said its government used the Russian Venture Company (RVC) as "one key tool of the state in the area of national innovation system development, which actively encourages technologies transfer in Russia".

He added: "With government support, RVC regularly leads Russian and international business trips, forums, conferences devoted to technologies transfer development and meetings of the All-Russian programme Russian Startup Tour."

In turn, Fedorova said UrFU "actively collaborates with RVC in the area of startup development, commercialisation and in [any] close co-operation with foreign universities in the US, Europe, India, China, Malaysia and Thailand".

Beyond education, UrFU in November set up an IT accelerator for 11 projects. After the three-month programme, four project teams showed some sales of their products, with Technovisor and DocWood both gaining R300,000 ($6,000) in grants and Vmeste and WriteUp R100,000 each.

Kendrick White, vice-rector of innovation at Lobachevsky State University of Nizhni Novgorod (UNN), also in Russia, said rapid changes had been made in the past 18 months after the government, RVC and universities recognised there had been a "lack of capacities inside typical Russian universities to engage with business and industry in efforts to commercialise their significant scientific innovations".

White said RVC had offered "significant support for our efforts, and has also offered great support in helping us to promote our approach to other interested universities as well as the regional innovation ecosystem participants".

He added: "The next step in this process is to work with the various Russian government ministries. UNN has been able to implement our reforms using the financial support of the 5/100 programme [to get five Russian universities into the top 100 leading world universities].

"The reforms, however, require significant financial commitments on the part of the university budget. Other universities have thus far not allocated funding for such efforts as we have made at UNN, but must begin to do so.

"For example, universities must begin to build their own internal capabilities to conduct international patent searches, international market research, sector-by-sector technology market research capabilities, and capabilities in preparing the basis for provisional patent applications for the US or other global markets."

He said RVC could also take a lead in developing access to market research reports to help researchers determine themselves the market relevance and uniqueness of their work, which could then be offered to regional Russian universities.

Other governments have also tried new ways to facilitate co-operation between industry and research staff, according to reviews by the Organisation for Economic Development and Co-operation, such as Australia's knowledge transfer centres, Belgium's Tetra project to support prototypes by small and medium-sized enterprises (SMEs) and organisations, Czech Republic's funding of PoC, France's Satts to reduce fragmentation, Mexico's Sectoral Innovation Fund (Finnova) to cover some TTO and SME costs, or Turkey's Tubitak 1513 TTO Support Programme.

They have also looked at ways of improving the legal framework through standardised licence agreements, such as in the UK, Germany, Denmark and across the EU by the Desca model, or making public research freely available, incorporated in Canada, US, Spain and New Zealand.

And governments are often funding stages of development before and after commercialisation, the latter often through venture capital. For the former, Australia's national science agency Csiro manages the country's Growth Partnerships as a competitive, merit-based pilot funding programme, Canada is providing $81m over five years under the Accelerator and Incubator Programme to help their expansion as part of its Venture Capital Action Plan, with the state-fund Business Development Bank of Canada offering the same amount again to firms graduating from the accelerators, while China has reduced funding to public universities since the 1990s but offers preferential tax and state loans to academia-university.

China's example

China, however, has also been more directly funding commercialisation of ideas. The country now runs at least 1,500 incubators under the Ministry of Science and Technology's 27-year-old Torch Programme, a nationwide initiative that provides policy, financing and consulting services for high-tech firms, according to newswire Bloomberg.

Beijing is expanding that number by 15% every year, according to the ministry in Bloomberg's article – the ministry also runs an innovation fund that has channelled RMB3.45bn ($555.5m) of investment into more than 3,000 projects in emerging industries, the newswire added.

Last year, almost 80,000 companies received services from government-run incubators, according to the ministry in Bloomberg's piece, to build up strategic emerging industries that include energy-saving and environmental protection, next-generation information technology, bio-technology, advanced equipment manufacturing, new energy, new materials and new-energy vehicles.

China is also adding a RMB40bn fund to its support for those sectors, the State Council said in January.

Russia assists university and industry liaison

By George Gogolev, head of innovation ecosystem development, Russian Venture Company

Russian Venture Capital (RVC) is a development institution and fund of funds established by the Russian government in 2007 to foster the venture capital industry in Russia. Since its creation, the VC industry has grown 10-fold, and even though we have seen corrections in the volume of deals in the past two years, the number continues to grow, which reflects a certain process of the market becoming more mature. RVC currently devotes most of its resources to developing the ecosystem in various regions of the country.

VCs in Russia currently face a dealflow issue, as the investment part of the ecosystem has outgrown the part, which generates startups. As part of the measures to correct this situation RVC has established a large number of programs aimed at developing startups, for example building accelerators, improving incubators and technoparks, and creating new dealflow from universities and scientific centres.

Traditionally, the Soviet structure of fundamental science and research and development (R&D) was geared towards large government projects and industries. This focus was lost over the past 30 years, but the main structures are still in place.

Unlike most western countries, fundamental scientific research is carried out within the institutes belonging to the academy of sciences. Universities primarily performed only the educational function. Industrial R&D was mostly conducted in sector-specific applied research institutions.

Naturally, current economic conditions require a major restructuring of the sector. Universities are beginning to acquire some research functionality, which is a prerequisite for creating technologies that could be spun out or licensed. However, the idea that a modern university is much more than just an educational entity is still accepted only by a few schools, which are beginning to develop entrepreneurship, corporate relations and tech transfer offices.

RVC is assisting universities in developing their ecosystems and integrating with the broader entrepreneurial, business and investment communities. Over the past two years, we have run regular study trips for top managers of Russian universities and regional authorities to the most developed ecosystems in Asia, Europe, America and the Middle East. For middle management we have arranged regular educational seminars, strategic planning sessions and supplied them with model documents on how to run various parts of the ecosystem.

These projects are currently shifting perceptions and encouraging change in the broader university and scientific communities as they engage more closely with tech businesses and learn the best practices.

Government venturing versus private venturing

By Martin Haemmig and Boris Battistini

When comparing the results of each nation on the three key performance factors – patent creation, follow-on financing and exits – there is no notable correlation. The key finding is that companies supported by government venturing tend to outperform those backed by private venturing on all three measures. However, in each category, some countries buck the trend.

Patent creation: Companies supported by government venturing perform better – except in the UK, Australia and China, where the effect is reversed.

Follow-on financing: Companies supported by government venturing perform better – except in Germany, India and China, where the effect is reversed.

Exits – IPO and trade sale: Companies supported by government venturing perform better – except in Canada, Japan, Germany, where the effect is reversed.

It is unclear whether Germany, which scores twice on negative effects, in exits and follow-on financing, but tops the list on patent creation, tends to invest in much riskier high-tech startups, where private venturers may shy away for that reason, although patent filings are not necessarily a measure of success for companies.

In contrast, Australia tops both successful exits and follow-on financing, but has a highly negative co-efficient in patent creation. This could lead to a conclusion that government venturers in some countries, such as Germany, take on riskier technology ventures with higher failure rates, and government operatives are not necessarily less experienced compared with private venturers or their counterparts in other nations.

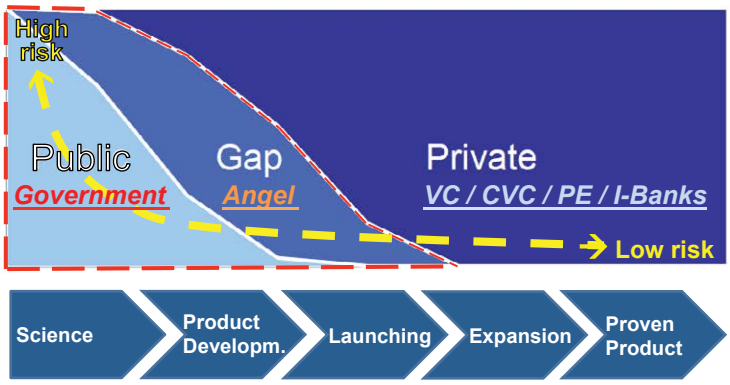
China is another extreme case, where government venturing scores negatively against private venturing in patent creation and follow-on financing, but tends to outperform private venturing slightly on exits. It is a fact that China had many government-owned funds that supported many companies from 2000-10, especially services businesses, which tend to be lower-risk deals and thus have a better probability of a successful exit. The Chinese government, however, has recently changed its approach and provides more grants to tech startups, and has also invested more in leading venture capital firms, in order to create more technology companies with solid hands-on support for successful growth and notable exit.

In summary, moderate government venturing seems to be a meaningful way to support new technology companies.

Boris Battistini is a senior research fellow at the Swiss Federal Institute of Technology (ETH Zürich) and an associate at Metellus, a venture capital firm based in Zürich, London and San Diego. Email: boris.battistini@metellus.ch. Martin Haemmig is an adjunct professor at CeTIM at UniBW Munich and Leiden University. Email: martinhaemmig@cetim.org

The funding gap for early-stage startups

Less developed VC nations foster government and some angel support



Source: Thomas Andersson, president of Jönköping University (11-2008). Updated: Martin Haemmig

Government policies and programmes as technology startup catalysts: Nations with a small business angel base and a lack of sufficient early-stage VC funds with a critical size could be supplemented with government hybrid funds. However, this requires a strong dealflow of high-potential firms. This allows these funds to specialise by technology sector and build the technical and commercial knowledge required to identify, support and promote the rapid growth of world-class, new technology-based young firms. Policy should be systematic, focusing on improving the flow of multiple funding rounds to high-potential young firms as they grow, thereby providing a funding escalator from formation to IPO or trade sale (M&A).

Major government VC support programmes

Examples of full, partial and indirect government venturing

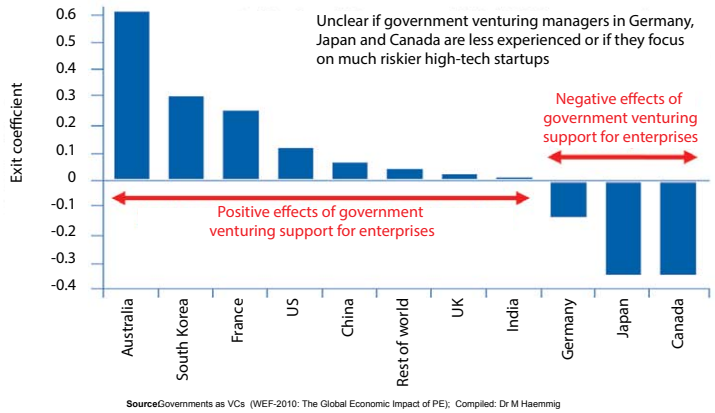
1. **Full: 100% owned by government**
   > Development Bank – Germany's KfW, SME Development Bank of Thailand
   > Investment Boards – Singapore's Economic Development Board
   > Direct Investments by government – the CIA's VC fund In-Q-Tel
2. **Partial: Private VCs with significant government investments**
   > US – Small Business Investment Company
   > UK – UK Innovation Investment Fund
   > Taiwan – Taiwan Development Fund
   > Guidance funds in China – Fund-of-funds investments in private VCs
   > Swiss CTI Invest – biotech, ICT, nano, med-tech, clean-tech
3. **Indirect: Significant government role to private VCs through subsidy, tax credit programmes, but no direct investments in companies**
   > ESVCLP in Canada – Labour-sponsored VC programme (favourable taxes)
   > BDC in Canada – Loans to companies, VC investments, mentoring
   > Private VCs associated – with World Bank, European Investment Bank

Source: Governments as VCs (WEF-2010: The Global Economic Impact of PE). Compiled: Martin Haemmig

How much government support and involvement is ideal? The challenge for government is to develop policies that work, but avoid the temptation to try to effect change via too much direct intervention and transactional activities. Balance it with encouraging sustainable, growth-oriented and innovative firms, not simply fostering more startups. Starting a new business is the easy part – successfully growing it is the challenge. The key is to grow firms with strong root systems that can sustain their own growth as much as possible before seeking additional funding. A growth-oriented approach is more relational in nature. This focuses on the entrepreneurial leadership of these growth firms. It seeks to understand their networks and how to foster the expansion of such networks at the local, national and international level.

Effects of government venturing on exits by country

Outperforms private venture capital, but not everywhere



SourceGovernments as VCs (WEF-2010: The Global Economic Impact of PE); Compiled: Dr M Haemmig

Nations with government venturing focusing on IP creation tend to have fewer exits: Higher-income countries, measured by per capita GDP, tend to have less government venturing activity but stronger exit performance. Higher-growth countries also tend to have less government venturing activity but weaker exit performance. Exit performance appears correlated with measures of financial depth, such as bank credit and the size of the stock market. Even one highly successful company, such as Research in Motion in Canada, can generate enough benefits to more than pay for the full cost of a nation's government venturing programme for many years. However, such exits (more than $250m) are rare, and only 0.28% of all enterprises exceed this threshold. In other words, the performance is measured by number of company exits and not by the cumulative exit values generated in each nation.

A positive coefficient in these and the following graphs means that in this country government venturing outperforms private venture capital. While the numerical value of the coefficient cannot be interpreted directly, the relative sizes of the coefficients reflect the comparative performance of government venturing initiatives across countries.

Government-sponsored VCs in the spotlight

By Martin Haemmig and Boris Battistini

Government venturing is an increasingly important part of today's global venture capital activities. According to the Global Government Venturing database, in Q4 2014, there were 173 investment deals with a government-backed fund in the syndicate and 12 exits through sale or flotation. During the same quarter, governments disclosed $1.25bn of commitments to 20 VC funds raising in total more than $3bn. In addition, more than 40 funds were raised with government commitments with closed or set target allocation from budgets of $18.65bn.

Following the remarkable success of private and corporate venturing funds in accelerating innovation and creating jobs, a significant number of governments have sponsored the provision of finance to entrepreneurial ventures. The active engagement of governments in VC activities is an important innovation strategy that complements, rather than substitute, the range of tax and R&D policies for venture capital.

But what is the record of government support for venture capital? What is the impact of government-sponsored VCs on the likelihood of success of new entrepreneurial ventures? A recent NBER working paper co-authored by James Breander, Qianqian Du and Thomas Hellmann empirically addresses this question using international enterprise-level data, which includes 21,852 ventures located in 25 countries that received funding in the 2000-08 period. The remarkable sample offers a substantial representation of US, European and East Asian markets along with Australia, Brazil, Canada, India and Israel.

The results show that "compared to a benchmark of ventures financed by private VCs, a small amount of government-sponsored VC investment appears to be a good thing, but larger amounts of government-sponsored VC investment decrease the likelihood of successful exit (IPOs and acquisitions)". Moreover, the study examines whether there is a difference in terms of performance between government-owned and government-sponsored VCs. The key insight here is that the superior performance of minority government-sponsored VCs applies only to government-supported VCs – support outperforms ownership. As the authors observe, the results indicate that "some market discipline helps make government promotion of venture capital more effective".

The graphs opposite highlight the key findings at different intensity levels against private VCs, as well as government-sponsored VC involvements by different global geographies and the government-sponsored VC participation in the various industry sectors where PVC invests. The three performance measures are based on the value of the enterprise, when exits occur through IPO or M&A, and by the total VC investment received by the enterprise. These value creation measures are closely related to the economic value of the enterprise. In summary, these performance measures are of interest in part because they reflect private returns – returns to VCs, other investors and entrepreneurs. In addition, these measures also reflect benefits to other parties such as customers, workers and other enterprises. In addition, successful enterprises help generate tax and other revenues for governments.

Reference

James Brander, Qianqian Du and Thomas Hellmann (Working Paper 16521, November 2010; http://www.nberorg/papers/w16521). The effects of government-sponsored venture capital evidence. National Bureau of Academic Research (US)

Findings: Impact of government VC (GVC) support

Private VC (PVC), moderate GCV and extensive GVC

1. **Value creation: Enterprises with moderate GVC support outperform those with private VC (PVC) and those with extensive GVC support.**
2. **Innovation: Enterprises with moderate GVC support outperform those with only PVC support and those with extensive GVC support in patent creation.**
3. **Employment: No significant differences in employment creation performance for GVCs and PVCs.**
4. **Type of government: GVCs associated with national governments and international organisations have stronger performance than PVCs, which in turn do better than sub-national / regional government GVCs.**
5. **Type of GVC: Partial GVCs and indirect GVCs exhibit stronger performance than full – government-owned.**
6. **Country-specific effects: GVC performance differ by country.**

Source: "Governments as VCs" (WEF-2010: "The Global Economic Impact of PE"); Compiled: Dr. M. Haemmig

Moderate government VC involvement is the way to go: The principal finding is the striking result that the strongest performance is associated with moderate levels of GVC involvement. Enterprises with moderate GVC support perform better on most dimensions than enterprises with no GVC support (that is, those that are supported exclusively by private VC/PVC) and they perform better than enterprises with extensive GVC support. One interpretation is that public venture capital support has legitimate contributions to make but that it seems to perform better when it is disciplined by the presence of private venture capitalists (PVC).

Enterprise value creation at different GVC intensity

Impact of moderate GVC and extensive GVC support

Variable name	No. of enterprises	Full sample average	GVC sample average	Moderate GVC average (<50% GVC)	Extensive GVC average (>50% GVC)
Exits (%)	28,824	14.40%	15.70%**	22.24%**	← 1:2 → 11.35%***
Exit value ($M)	947	84.57	99.80	120.75**	← 1:2 → 58.78
Home runs >$250M (%)	28,824	0.28%	0.28%	0.56%*	← 1:9 → 0.06%*
Years to exit	1,456	3.91	3.88***	4.37***	← 1:1.5 → 3.00
IPOs (%)	28,824	4.50%	6.15%***	7.04%**	← 1:1.3 → 5.55%**
Investments ($M)	23,431	23.05	23.75	38.14***	← 1:3.7 → 10.22***
Later rounds (%)	28,824	36.33%	43.07%***	72.20%**	← 1:3.1 → 23.69%***
Investments later rounds ($M)	9,646	35.16	30.34**	37.19*	← 1:2.7 → 13.69***

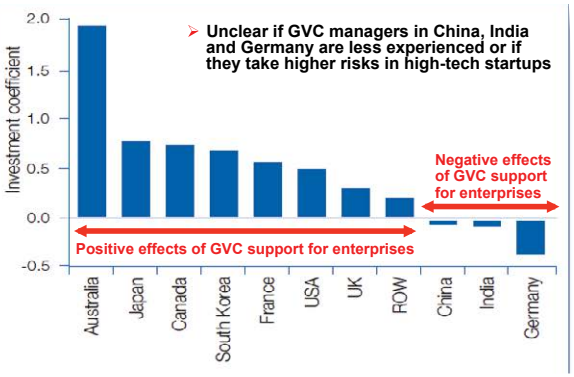
- **'Moderate GVC' financed companies perform much better than 'Extensive GVC'**
- **Of 4,150 successful exits, detailed data is available for only 25% (approx. 1,000).**
- **Confidence level: *** = 99%, ** = 95%, * = 90% (hence, statistical significance)**

Source: "Governments as VCs" (WEF-2010: "The Global Economic Impact of PE"); Compiled: Dr. M. Haemmig

Moderate GVC Wins over extensive-GVC and PVC in all dimensions: The three performance measures are based on the value of the enterprise, when exits occur through IPO or M&A, and by the total venture capital investment received by the enterprise. Moderate GVC involvement has positive impact on all variables considered, from VC investments (investment amount, later round financings) to exits (by numbers and valuations and home runs >$250m). The only variable that was rather negative over extensive GVC and private VC (PVC) was the time it takes to exit by years. However, the longer holding time can also lead to larger companies and thus to higher exit valuations.

Effects of GVC on subsequent investment by country

GVC outperforms pure private VC (PVC) but not everywhere

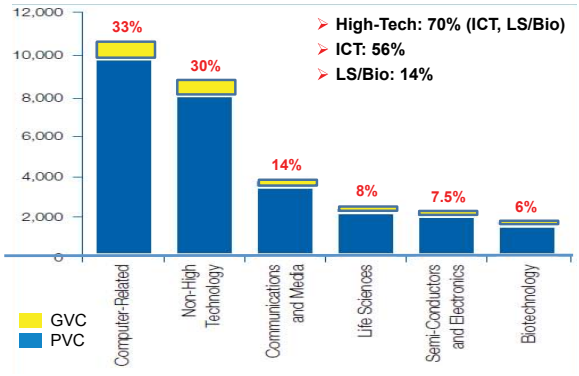


Source: "Governments as VCs" (WEF-2010: "The Global Economic Impact of PE"); Compiled: Dr. M. Haemmig

GVC supported companies tend to do well in most countries: Even in the few countries where GVC support does not perform as well as PVC support, GVCs might still be a good investment from the public point of view. In principle we should not be surprised or alarmed, if some GVC-supported enterprises exhibit weaker performance than enterprises supported purely by PVCs in some countries. It is unclear if China, India and Germany invest into much riskier high-tech startups, where PVCs may shy away for that reason. This may be seen in another set of results, where Germany and India end up on the positive side of the spectrum on their patent filings (which is not a measure of success of a company), vis-à-vis the private VCs (PVC).

Investment distribution to enterprises by industry

Private VC (PVC) vs government VC (GVC)



Source: "Governments as VCs" (WEF-2010: "The Global Economic Impact of PE"); Compiled: Dr. M. Haemmig

Government VC is Represented in Most Sectors with a Minor Portion: Between 2002-2008, the governments (GVC) in the 25 countries surveyed invest consistently about 8-10% of the total VC investments, either direct or indirect. Interestingly, no specific sector seems to have a specific priority overall, while some countries may favor a specific technology (i.e. Germany help significantly support the Biotech and Cleantech startups though direct or indirect investments, including significant seed-stage government grants).

Patent demands

By Martin Haemmig and Boris Battistini

Are patent demands a significant problem for venture-backed startups? Does the possibility of selling patents influence the likelihood of investment of VCs and strategic investors? Would VCs and strategic investors be deterred by patent demands against a startup they are considering? What is the effect of patent demands on the development of venture-backed startups?

To address these questions and establish the impact of patent demands on both startups and venture investors, R. Feldman, a Professor of Law and Director of the Institute for Innovation Law at University of California Hastings, conducted a study through the members of the National Venture Capital Association and their portfolio companies.

The results are sticking: 70% of venture investors have portfolio companies that have received patent demands in the information technology sector, while 30% also have experienced patent demands in IPR-intensive industry such as life science. Perhaps even more interestingly, the vast majority of patent demands against the venture-backed startups come from entities that license or litigate patent as their core activities.

The study reports that for the majority of both the venture capitalists and entrepreneurs patent demands had a significant impact on the startup: the economic costs of preparing for and defending against patent demands exceed $50,000 per startup, with a number of startups reporting costs in the millions of dollars.

The effect of patent demands is even more significant if we take into consideration that the absolute majority of investors would not consider the potential selling of patents to patent assertion entities and that more than two-thirds on VCs and strategic investors do not see patent assertion as positive for startups and, more broadly, the startup community. A 100% of venture investors reported in the study that if a company had an existing patent demand against it, it could potentially be a major deterrent in deciding whether to invest.

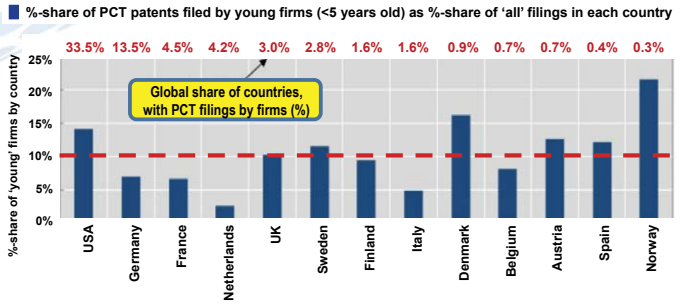
The impact of patent demands on the VC and the startup community should not be underestimated. Indeed, as observed by the author: "the cumulative impact of patent assertion in its various forms is staggering. Although difficult to measure with any accuracy, scholars have estimated that patent assertion by monetisers cost US companies $29bn in 2011 alone. These estimates suggest that only 20% of that cost flows back to innovation, either to outside inventors or to any internal research and development by monetisers." The recent trend of modern patent monetisation, i.e. the drastic increase in the percentage of patent lawsuits filed by "those who do not make products", is likely to further impact on the dynamics of entrepreneurial innovation. In fact, as a venture investor reported in study: "When companies spend money trying to protect their intellectual property position, they are not expanding; and when companies spend time thinking about patent demands, they are not inventing."

Reference

Feldman, R (2013) Patent demands and startup companies: The view from the venture capital community. UC Hastings research paper No 75.

Young firms at the heart of innovation

PCT patenting activity of 'young' companies (<5 years old), 2005-2007



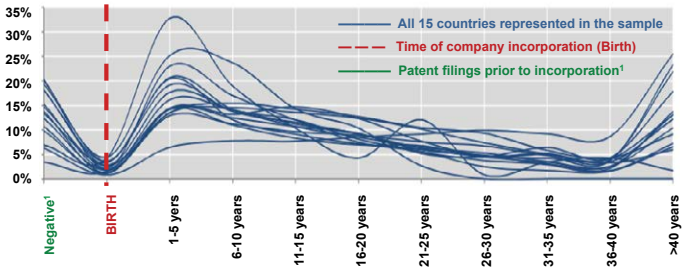
Note: Data refers to patent applications (PTC) with a priority in 2005-2007. Patent counts are based on the country of residence of the applicant. The share of young firms is derived from the set of patent applicants successfully matched with business register data.

Source: OECD 2010, 'Measuring Innovation: A New Perspective' / (Compiled, Dr. Martin Haemmig)

New firms account for a large share of patenting in OECD: Data refer to patent applications filed under the Patent Co-operation Treaty (PCT) by firms with a priority in 2005-07. Counts are based on a set of patent applicants successfully matched with business data. For example; US firms account for 33.5% of overall/ global PCT filings by firms, and 14% of these are applied for by firms under five years old. In addition, a deeper analysis of Europe's fastest-growing companies shows that companies founded by repeat entrepreneurs have higher sales/revenues and higher employment growth than companies run by first-time entrepreneurs or the ones who have never failed.

Age of patenting firms at the time of 1st filing

EPO, USPTO or via PCT (2011)



[1] Negative age: 53% of the companies filing 'prior' to incorporation do this 1-5 years ahead

Note: The lines represent countries in the sample. The age of the patenting firm refers to the difference between the earliest date of application at EPO, USPTO or via PCT and the date of incorporation as reported in OECD-ORBIS 2011.
Source: OECD calculations based on EPO Worldwide Patent Statistical Database (April 2012) and OECD-ORBIS 2011, Oct. 2012.

Source: OECD 2013, 'Cross-Country Patenting Behavior of Firms'; STI W.-P. 2013/5 / (Dr. Martin Haemmig)

The first 10 years of existence tend to be the innovation phase: The graph shows the distribution of firm age at the time of the first patent filing. Each line represents one of the 15 countries considered in the analysis and the percentages shown correspond to the proportion of firms of a certain age class that patent for the first time. For each country – line – considered, the sum of the shares observed at each of the points in time detailed in the figure adds up to 100%, i.e. the total number of firms applying for the first time for a patent. A notable proportion of firms further seems to apply for patents even before being established. This may be the case when startups are created or when mergers and acquisitions regard firms having patents in portfolios that pre-date the creation of the merging or acquiring firm.

GVC–venture patents with government support

at Full Global sample / GVC sample / GVC Moderate / GVC Extensive

Variable Name	No. of enterprises	Full sample average	GCV sample average	Moderate GVC average [1]	Extensive GVC average [2]
Confidence level: *** = 99%, ** = 95%				(<50% GVC)	(>50% GVC)
Prior Patenting	28,824	9.22%	9.44%	11.12%	8.33%
No. of prior patents	28,824	1.09	0.89	**0.92	0.86
Patenting	28,824	22.51%	***27.70%	***33.18%	***19.06%
No. of new patents	28,824	4.13	***4.54	***7.72	***2.42

[1] Moderate GVC: this includes government investments (direct or indirect through VC funds) of <50% of total investments.
[2] Extensive GVC: this includes government investments (direct or indirect through VC funds) of >50% of total investments.

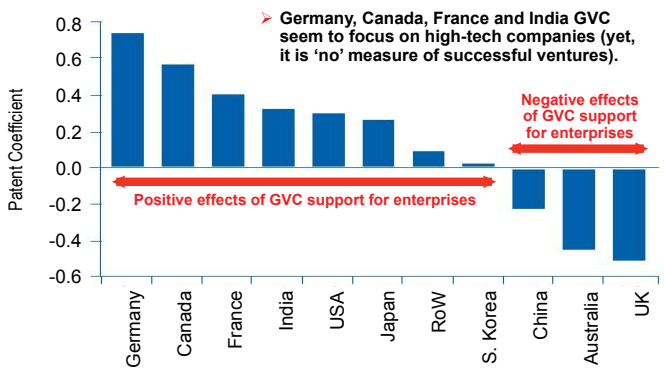
- **Prior patenting:** …….. % of enterprises that published at least 1 patent prior to obtaining 1st round of VC investment.
- **No. of prior patents:**... Number of patents published prior to obtaining 1st round of VC investment.
- **Patenting:** ……..…. % of enterprises that published at least 1 patent after obtaining 1st round of VC investment.
- **No. of new patents:** … Number of patents published after obtaining 1st round of VC investment.

Source: "Governments as VCs" (WEF-2010: "The Global Economic Impact of PE"); Compiled: Dr. M. Haemmig

Moderate GVC provides the best results for patent creation: Moderate GVC (government VC) support/investment outperforms pure PVC (private VC) and extensive GVC in all categories (incl. larger number of patents). In addition, prior and post investment show a positive impact on patenting. On the other hand, extensive GVC support (>50%) shows the poorest patent-related impact. When comparing the broader business impact of GVC vs PVC in each nation, there is no notable correlation among the three key performance factors – patent creation, follow-on financing, and exits. Nevertheless, the key finding is that moderate GVC tends to outperform PVC supported companies and extensive GVC on all three measures.

Country specific effects of GVC on patent activities

Government VC support tends to create companies with more patents



Source: "Governments as VCs" (WEF-2010: "The Global Economic Impact of PE"); Compiled: Dr. M. Haemmig

GVC with a positive coefficient outperform private VCs (PVC): When comparing GVC (government VC) financed ventures vs. PVC (private VC), GVC supported firms tend to outperform (except UK, Australia, China). Government can have significant impact on creating new industry sectors when supporting new ventures. In the case of Germany, the biotech and cleantech industry would not be anywhere at today's scale, had the government not supported academia and the early-stage financing (even at a high cost). Even in 2014, the 100% owned government investment unit for startups (KfW) remains the largest single investor, across multiple stages, in order to help them boost all the way through. However, in most financing rounds, other VCs and CVCs will be lead or co-investors.

The emergence of collaborative funding

By Janke Dittmer, partner, Gilde Healthcare,
Joseph McCahery, professor of international economic law, Tilburg Law School,
Erik Vermeulen, professor of business and financial law, Tilburg University

What should governments and policymakers do to create an ecosystem in which small and medium-sized enterprises (SMEs) can thrive? There is long-standing evidence on how governments can encourage entrepreneurship and the launch of startup companies. Governments may influence the development of SMEs by providing financial support and promoting external funding of SMEs. More recently, however, researchers have argued that governments can only play a very limited role in the emergence and development of high-growth and innovative companies (Lerner 2009).

What this research shows is that government initiatives are usually characterised by poor design and a lack of understanding of "entrepreneurial ecosystems" (Hwang and Horowitt 2012), resulting in bureaucratic, cumbersome and inefficient practices.

There is also a related, but largely unexplored, idea in the literature, that addresses why disruptive innovations and technologies require government support (Mazzucato 2013). In fact, it could be argued that with the financial crisis and the subsequent economic downturn having taken its toll, there is a crucial role for governments in funding and facilitating innovation and entrepreneurship. We observe that governments, aware of new opportunities that the financial crisis offers, have sought to reduce entry barriers for startup firms. Two distinct approaches aimed at stimulating entrepreneurship are relevant to this discussion.

First, governments have modernised and simplified corporate law statutes in order to offer business forms in which SMEs can be simply started and nurtured into bigger ones (Reyes and Vermeulen 2013).

Second, programmes have been launched under which smaller businesses are provided with certain registration exemptions and tax benefits. Consider the Auto-Entrepreneur programme in France, which reduces red tape for smaller firms in the areas of business registration and social security and tax payments. Evidently – and despite being prone to misuse – the French initiative had a positive impact on the total number of French startup companies (Perman 2009). In 2013, it was assumed that approximately half of all the new businesses in France were set up under the Auto-Entrepreneur regime. At the end of 2012 the count was about 870,000 businesses (Carnegy 2013). One may suspect that while most of these companies disappear or remain micro-businesses, some of them may actually become market leaders.

In the aftermath of the financial crisis, policymakers, measures have been unveiled to relax rules and regulations governing initial public offerings (IPOs), and the organisation of listed high-growth companies. This is reflected by the signing of the Jumpstart Our Business Startups Act (Jobs Act) in the US on April 5 2012. The act introduced, among other things, the emerging growth company (EGC) status.

Companies that are able to avail themselves of the EGC-status are offered a transition period – or "on-ramp" period – during which they are exempted from a number of regulatory requirements associated with going public. We see similar initiatives in other parts of the world. In Europe, for instance, stock exchange NYSE Euronext has introduced EnterNext, the new pan-European Entrepreneurial Exchange with lighter rules and regulations tailored to the needs of SMEs, particularly

high-growth companies. According to UK policymakers, relaxation of listing rules can more effectively induce emerging growth companies to overcome their reluctance to enter the bureaucratic and overregulated world of listed companies. Besides deregulatory initiatives and fiscal incentives, governments have provided direct funding to entrepreneurial and innovative companies. In this context, government funding is considered to be the main driver behind both "sustaining and disruptive innovations" (Mazzucato 2013), particularly in the areas of biotechnology and clean technology. The reason for this is simple – governments have generally been more inclined than private actors to make highly-risky and long-term investments in early-stage proof-of-concept and early-stage projects.

Recently, governments have also introduced incubator and accelerator programmes (Economist 2012). Startup Chile is an example of an incubator. This government initiative is successful in luring foreign entrepreneurs to Chile by offering them a relatively small amount of cash of $40,000, a temporary working visa and local support (Van Edwards 2013). During the application round in 2013, the programme selected 100 startup companies, from 28 different countries), out of more than 1,570 applications. In comparison, the programme provided startup capital to 87 companies from more than 30 countries to Chile in 2011 after having received 330 applications.

While most empirical work has focused on the creation of high-growth startups and the funding of early-stage projects, the real challenge is tapping the growth potential of the most promising startups (Pierrakis and Westlake 2009).

Private investments, in the form of venture capital, are usually needed to bring innovative ideas to the market and support the further growth and development of high-growth companies (Gompers and Lerner 2001).

In other words, venture capital is needed to get the startup companies through the "valley of death", which can be defined as the period between the initial capital contribution and the time the company starts generating a steady stream of revenue.

Unfortunately, however, the economic downturn had, and still has, a severe impact on the venture capital industry. Yet despite its focus on the creation of new business startups, venture capital has become another important policy focus that has recently gained momentum due to it becoming a less

accessible source of capital, creating funding and investment gaps in the ecosystem. For example, governments, in their efforts to establish a sustainable venture capital ecosystem – and largely because institutional investors, such as banks, insurance companies and pension funds, remain sceptical about the industry – have become the main post-financial crisis investors in Europe. Data from the European Private Equity and Venture Capital Association show that 39.1% of the €4.1bn ($4.8bn) that was raised by European venture capitalists in 2011 came from government agencies. In 2007, this figure was 9.9% (of €8.2bn). Investments by the European Investment Bank, the European Investment Fund and other European Commission resources account for approximately 23% of the total capital raised in 2011.

Note, however, that governments cannot substitute for the lack of institutional investors' commitments. Several reasons have been proposed to explain why governments are prevented from funding a greater share of the private sector's investments. First, government-backed venture capital funds are still relatively small in number and often have a regional focus. This regional focus does not seem to change if a fund's capital is committed by European government agencies. In this respect, it is interesting to see that in 2011 more than 50% of the 42 funds that attracted investments from EU resources, such as the European Investment Fund, had a domestic focus. Second, government funds tend to underperform if non-financial objectives, such as contributing to structural, regional and sectoral development policies, prevail (Kelly 2011).

We can extend the previous hypothesis by considering what can be done to create a robust venture capital ecosystem in which venture capital is more accessible for emerging growth companies. Is there a role for governments in the venture capital finance of these companies?

As noted above, empirical research suggests that a mix of government and private investors is crucial to the realisation of a sustainable venture capital ecosystem in which funds are available and accessible in terms of speed, clarity, transparency and connectivity to other stakeholders in the industry (Brander, Du and Hellmann 2010).

These findings suggest a related question: what can governments and policymakers do to unleash private sector investments?

In this context, it should be noted that an array of policy and regulatory measures has been introduced over the last two decades in an effort to replicate the success of the world's most successful venture capital ecosystem, Silicon Valley.

We are all aware of the success stories of entrepreneurs that started their businesses – and developed their innovative ideas – in garages and basements and built them into global market leaders. The Silicon Valley model, however, is not easily replicated (Hwang and Horowitt 2012). Indeed, an account that focuses on the measures that were introduced by governments around the world does not examine how the specific characteristics of Silicon Valley – the interactions among both public and private capital providers – can help turn innovative ideas into vibrant companies.

For instance, policy initiatives that only focus on early-stage venture capitalists could crowd out the supply of risk capital in the later stages of a startup company's development. Consider the case studies and empirical research that show that tax incentives encourage individual investors to pour money into special venture capital vehicles reduce the supply of other, relatively more informed venture capital investments (Cumming and MacIntosh 2006).

This phenomenon is particularly strong if not all players in the ecosystem are likely to benefit from the regulation (or are exempted from strict regulations).

This paper argues the funding or investment gaps in the venture capital cycle are likely to be filled partially by alternative investment options and new types of investors, such as super-angels, or micro-

The positive impact accelerators have on ambitious startups is evident in the powerful relationship-building opportunities and coaching insights top programmes offer founders

venture capital funds, and crowdfunding platforms, if used by traditional angel investors and venture capital funds.

To support this position, we looked at trading platforms and discuss how they can bridge the liquidity gap in the venture capital cycle and reduce the fragmentation of the venture capital industry.

Indeed, profound changes in the venture capital ecosystem, particularly the increase in the time that elapses between the inception of the startup company, its first equity investment and the eventual exit, have arguably led to a liquidity gap in the cycle. In the context of the gaps in the venture capital cycle, the paper also shows the extent to which corporate venture capital increasingly has the potential to significantly contribute to the growth of SMEs and also create more liquidity in the cycle. The paper proposes that the new collaborative venture capital models may provide an effective basis for funding innovative firms. One of the features of these new models is that corporations have increasingly become anchor investors in early-stage venture capital funds that invest in both related and apparently unrelated industries.

The final claim advanced is that government involvement in the venture capital cycle can provide important support for startup companies. We show that the experience with successful government-sponsored funds, such as the German High-Tech Gründerfonds, confirms that the network creating capabilities of these initiatives has the anticipated productivity effects for large corporations, venture capitalists as well as the entrepreneurs.

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Janke Dittmer is a partner at Gilde Healthcare. Joseph McCahery is professor of international economic law at Tilburg Law School and Tilburg Law and Economics Centre, and programme director at Duisenberg School of Finance in Amsterdam. Erik Vermeulen is a professor of business and financial law and director of the international business law programme at Tilburg University and Tilburg Law & Economics Centre, and senior counsel corporate at Philips in Amsterdam.

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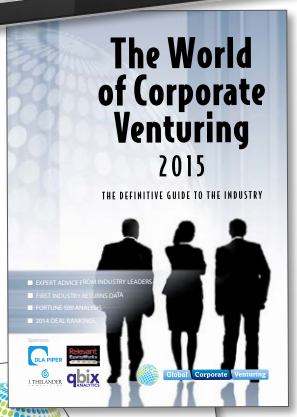

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