

FOR WITHOUT INNOVATION, THERE IS NO FUTURE

Accelerating the European recovery and sustainable transition through an investment strategy for innovation ecosystems

Authors: **Filippo Addarii** (PlusValue), **Alan Barrell** (Cambridge Learning Gateway Ltd), **Alessandro Fazio** (European Commission, Joint Research Centre - JRC), **Martin Hinoul** (KU Leuven R&D), **Sheron Shamuilia** (European Commission, Joint Research Centre - JRC)

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Filippo Addarii (PlusValue), Alan Barrell (Cambridge Learning Gateway Ltd), Alessandro Fazio European Commission, Joint Research Centre (JRC), Martin Hinoul (KU Leuven R&D), Sheron Shamuilia European Commission, Joint Research Centre (JRC)

COVID, the turning point

Back in December 2019, the word ‘innovation’ had become prosaic, part of the spent vocabulary of the every-day. Governments, companies, and the media all joined in the daily, collective cacophony of innovation procurement, open innovation, social innovation, disruptive innovation, service innovation, mission-oriented innovation... But just as quickly as innovation became the new mantra, come 2020, the world was awakened to its essential importance in ensuring humanity’s actual survival. The Covid-19 pandemic – and the accelerated search for vaccines - has underlined the relevance of innovation not just for putting an end to the ongoing pandemic but also for addressing other existential threats we currently face starting with climate change.

At the beginning of last year, coronavirus brought life, as we knew it, to a grinding halt and the whole world to its knees. The economic, social, and public-health related costs have not yet been accurately calculated, but they are certain to run into the hundreds of billions of euros. Lockdowns have impacted disproportionately on the poorest and most vulnerable members of society: those living in crammed accommodation, the elderly and the sick, those in abusive relationships, children from poor households unable to keep up with their schooling, blue-collar workers unable to continue working from the comfort of their living rooms. The virus has exposed the rift valley separating the haves and have-nots in allegedly egalitarian European social democracies.

The arrival of vaccines in December 2020, promised to reduce the intensity of the pandemic or even put an end to it. But the vaccine can only address the *health* crisis. Recovering from the pandemic, is going to be nothing short of a titanic effort. As Europe slowly emerges from devastating lockdowns, multiple challenges will have to be confronted, simultaneously. Vaccines will have to be manufactured and distributed effectively, large sectors of the economy will need to be taken off life support and revitalised, if possible. Meanwhile, the climate emergency is only likely to gather pace, together with the need to accelerate a green transition that will have to involve potentially unpopular radical reforms. All the above occurs at a time of increasing geopolitical volatility, increasing polarisation and divisions in Western societies, a more tired and inward-looking United States, and the emergence of China as an alternative global power.

Science parks and innovation districts: rethinking strategy and places for innovation

Back in February 2020, when the pandemic struck, we - at the Joint Research Centre of the European Commission¹ - were working on a research project on governance and investment models for Science and Technology Parks and Innovation Districts. The crisis has forced us to revisit the purpose of this work, considering the pandemic as an opportunity, to help Europe lay the foundations for a durable recovery and transition towards sustainability.

Innovation is essential as it lies at the centre of the societal transformations that need to occur to address the challenges of the post-pandemic recovery and the twin green and digital transitions. It is,

generally, recognised as having a critical impact on firms' level of productivity and on the competitiveness of European industry.

Innovation has been changing in recent years. The pace of technological evolution continues to accelerate, along with the need for increasing cross-discipline collaboration as technological convergence gathers pace. The need for ever broader collaboration (inter-organisational, inter - regional and international) and cooperation (with customers, suppliers, users and even the general public) in sourcing and developing technologies through open innovation paradigms is redefining the role of intellectual property and proprietary know-how. In these circumstances, it is no longer sufficient to think of innovation in traditional terms as a phenomenon pertaining exclusively to economic agents.

A systemic change needs to occur and requires a comprehensive perspective. In other words, an ecosystem approach to innovation needs to be adopted, covering changes in the relationship between actors in ecosystems, a redefinition of the role of governments and public authorities and the development of innovative approaches to driving engagement and collaboration between governments and the private sector (both for profit and not for profit). The quality of available institutional infrastructure, social norms and environment will also be essential components of the local operational context and constitute key enabling conditions.

Research and innovation, even in a globalised and interconnected world, retain important connections to local conditions, geography, and ecosystems. All over the world, from Silicon Valley to Cambridge (UK), to the Leuven-Aachen-Eindhoven triangle, and the Greater Bay Area (Guangzhou-Dongguan-Shenzhen), the development of vibrant innovation ecosystems has been driven by a combination of outstanding research, plentiful supply of entrepreneurial talent, availability of finance, technological convergence, local economic conditions, social networks, and - in some cases - supportive public sector involvementⁱⁱ.

Innovation also depends on the availability of research infrastructure (laboratories, machinery, computing facilities etc.) and ancillary facilities in the form of spaces, be they physical (incubators, accelerators, co-working spaces, etc.) or virtual, towards which heterogeneous cohorts of individuals and groups can converge, generating the necessary critical mass for an ecosystem to develop.

In trying to identify the most appropriate level of granularity at which to focus public policy intervention in support of innovation, innovation districts seem to be attracting an increasing amount of attention and analysis. Innovation districts are the last generation of science and technology parks born from the desire to reintegrate research and innovation processes into urban areas and have become important instruments to drive ambitious urban regeneration agendasⁱⁱⁱ. The great concentration of knowledge, talents, capital, and innovative capabilities that are mobilised in successful innovation districts makes them ideal candidates for leading the pandemic recovery and for accelerating the twin digital and green transitions.

Innovation districts also have an often overlooked cultural function that is not irrelevant to countervailing the growing distrust towards scientific and technological progress. Such sites, when open to the public, become live demonstrators of the new solutions for living that science and technology can produce. They not only educate, but also engage the public, as test beds for real citizen participation in the innovation process. This "*living labs*" approach, originally developed in Europe, has generated interest way beyond its borders and it is noteworthy that in China there has been a significant shift in the direction of edutainment where Innovation Districts and Science and

Technology Parks are assuming the role of attractions for families and children in addition to their ordinary operations.

No innovation ecosystem is an island

Innovation ecosystems are not isolated standalone places that can expect to succeed on their own. Thriving innovation ecosystems are global hubs, endowed with cutting-edge facilities and infrastructure and are hyper-connected to the rest of the world. They compete with each other in the attraction of talent and resources by delivering not just leading-edge research and innovation related infrastructure and services, but also by investing in delivering superior living standards combining affordable housing, green spaces, experimental culture, creativity, and openness to all forms of diversity. But it is about more than just competition. The connectedness of ecosystems to the outside and with other districts is a noteworthy critical element. Greater attention needs to be paid to networked innovation clusters as we have seen emerging, especially in Asia through megaregions^{iv}. In Europe, a successful example is ELAT^v - the Eindhoven-Leuven-Aachen Triangle, that has brought together three innovation clusters located in three different member states, separated by no more than an hour's travel. Health Axis Europe^{vi} (HAE) a strategic alliance between the biomedical clusters Leuven (Belgium), Heidelberg (Germany), Maastricht (Netherlands), and Copenhagen (Denmark) is also a good example. The European Commission's "European Universities" initiative, with European Universities being transnational alliances of high education institutes across the EU, focusses on areas such as sharing research and innovation infrastructures and resources, having the potential to further enhance the connectedness of ecosystems^{vii}.

The innovation ecosystem that has emerged in Cambridge (UK) provides a good example of these dynamics at play. The Cambridge cluster is a mature cluster with a history of 50 years (25 Science Parks and innovation centres and thousands of innovation-based companies within a 20 km radius of Cambridge City) that has attracted significant international investment as well as important international players from other parts of Europe (e.g. Astra Zeneca), the USA (Microsoft and all the big platform players) and China (Huawei, TUS Park-Tsinghua and Tencent to name but three). Moreover, Cambridge has attracted a total over €1bn in international venture capital investments. Not only finance, but talent has been flocking in – so much so as to change the balance of ethnic diversity significantly. And this ethnic and cultural diversity has also been a contributor and enhancer to innovative capabilities. This is what has been defined the "Cambridge Phenomenon", a blue- print for any other innovation district worldwide^{viii}.

No reader should conclude that the development of such complex and distributed innovation ecosystems can be dictated top down by an authority. The experience of the authors suggests that such complex systems tend to emerge and are driven by interpersonal and institutional relationships, by shared research and innovation agendas and that they grow, over decades, through joint effort^{ix}. Public authorities and investors can provide enabling conditions but cannot replace networks and entrepreneurial individuals driven by sheer conviction and passion or, perhaps, operating under the spell of creative ignorance^x.

Public Private Partnerships for innovation ecosystems

To this day, governance and investment models powering innovation districts in Europe and beyond have received comparatively little attention. Several innovation districts have developed organically, over long periods but a significant number have developed as collaborations between public and

private investors, operating together through a variety of collaborative forms of partnership. Such partnerships are likely to become the critical factor for success in the future.

Throughout 2019-2020, the Joint Research Centre of the European Commission conducted a study on Public Private Partnerships for Science and Technology Parks and Innovation Districts in collaboration with the International Association of Science Parks (IASP)^{xi}. The report provides an analysis of various models of public-private cooperation used for the planning, construction, and management of a number of Science and Technology Parks and Innovation Districts worldwide.

There is significant variability in the models in which public-private cooperation is expressed in connection with different projects and places,- ranging from the use of Build-Own-Operate-Transfer (BOOT) models, all the way to design-construct-manage-finance (DCMF). The most significant commonality and defining factor is the cooperation between a public sector partner and a private one which have substantially different goals and assets. The public sector partner aims to fulfil a public policy objective, often linked to improved competitiveness, greater firm creation, upskilling and employment creation, local regeneration. On the other hand, the private sector partner is a for profit company possessing critical resources and competences necessary to successfully implementing the project, not least by connecting research and industry and securing long-term commercial success.

An important finding of the research has shown that innovation districts are ideal opportunities for institutional investors to allocate significant amounts of patient capital looking for safe and stable returns. The way in which risks and rewards are shared between public and private sectors, legally, organisationally, and financially is critical to the long-term viability of these projects and is the essential element of a successful public-private partnership.

Even though several examples of cooperation between public and private sectors on the planning, development and management of innovation districts have been identified, the involvement of the private sector in most cases has been predicated on the application of traditional bankability criteria, as normally used in more traditional PPPs or real estate transactions. These are based on the modelling of future revenues (i.e., discounted cash-flow projection) from occupancy and real estate value appreciation as the primary source of profitability for private sector's investments. This traditional investment appraisal model leaves little room for consideration of other opportunities – often more complex but greater in both size and ROI-generated by innovation districts: from the generation of research results to the creation of protected IP, to the launch of start-ups and university spin-off companies. The simple real estate investment model also fails to quantify the positive cultural, socio-economic, and environmental externalities of such projects or – in other words- their public value.

Among the cases covered by the above-mentioned study, only two qualify as fully fledged Public Private Partnerships based on the granting of an operational concession to a private operator: Here East in London, one of the legacy projects of the 2012 Olympic Games, and Milano Innovation District (MIND), the legacy project of the World EXPO 2015. MIND, in particular, stands out in terms of scale and the sophistication of its business model. It aims to convert the 1m sqm site on which the World EXPO took place in 2015 into a specialised technology and research cluster focused on life sciences and sustainable solutions for the smart city. The project was designed from the beginning as an innovation ecosystem integrated in the urban context and constructed as a joint venture between a consortium of public and private sector partners with an approximate amount of €5bn of combined investments. The outputs of the innovation ecosystem are the value drivers of the regeneration exercise and this type of approach - which was stress-tested and validated during the pandemic – holds great replication potential for the future.

Prioritizing EU investments in innovation ecosystems

Research and innovation will have a pivotal role to play in supporting the development of the technologies and innovations necessary to navigate the twin green and digital transitions (without forgetting the social one). They are emerging as increasingly appealing investment destinations satisfying the needs of: 1) accelerating the development of the technological solutions needed to power the green and digital transitions, 2) offering investors long-term sustainable investments with predictable returns, 3) investing in projects that improve the long-term competitiveness of the European economy, 4) contributing to urban regeneration and the upgrade of city infrastructures, and 5) investing in projects that have a visible and tangible impact for citizens wellbeing.

Thanks to the unprecedented effort of the EU, over the next months, massive public investment is going to become available to support all member states. Next Generation EU (which includes the €672.5 billion Resilience and Recovery Plan) will -at €750 billion - be approximately six times larger than the Marshall Plan. These funds will need to be directed to projects that can deliver significant long-term returns not just financial but also in terms of long-term competitiveness, growth, and future jobs and – especially – support the transition towards a decarbonised economy. According to Mark Carney (quoting the International Energy Agency^{xii}), the green transition alone will cost \$3.5 trillion a year, for 30 years. Public intervention will, therefore, have to crowd in private investments.^{xiii}

Innovation districts are good investment candidates for three reasons: 1) The world is on the cusp of a new technology revolution driven by the convergence of biosciences, ICT and Energy technologies. Similar technological convergence processes have previously provided phenomenal impetus to the growth and expansion of innovation ecosystems like Silicon Valley and Cambridge, UK. 2) The urgency of addressing the ongoing climate emergency is unlocking vast public sector resources – political, regulatory, and financial – to push for a rapid decarbonisation of economies on a global scale. Supporting the innovation clusters capable of delivering (and testing) the technological innovations necessary to support this process is going to be high on political agendas globally. 3) The critical climatic and public health situation will generate the political consensus necessary for decisive action supported by public opinion. The investment attraction of innovation ecosystems is illustrated by the recent entrance of AXA Investment Managers in the European Life Science sector, by acquiring Kadans Science Partner, which is a fully integrated developer, owner and manager of science parks. According to AXA “a key element of Kadans’ success has been the creation of innovation ecosystems not just within the individual building and campuses it operates but across its whole network of tenants and relationships across Europe.”^{xiv}. This further emphasises the added value created by connectedness within and across innovation districts.

Policymakers should therefore also consider the distributed capabilities of the macro innovation ecosystem in Europe. Leveraging on regional clusters and cross-border networks (as exemplified by ELAT) is crucial for maximising the return on deployed public resources.

Crowding in private investments, the next challenge

In mid-2020, the Joint Research Centre of the European Commission initiated a new study on innovative investment models for sustainable urban innovation ecosystems with an infrastructure component – focused on the attraction of mainstream private investors.

The purpose of this study is to address some of the criticalities highlighted above and to develop i) a conceptual model incorporating all different value generation mechanisms occurring in innovation ecosystems – including intangibles such as IP, data and new social and environmental assets , ii) metrics and methodologies to rigorously measure impact – economic, social and environmental - and

iii) innovative financial solutions such as sustainable investments (ESG), green bonds, impact equity investments, social outcome contracts that have skyrocketed over the last 2 years driving billions (over €800bn in the EU in 2020)^{xv} towards what the European Union has recognised as the public and private finance to deliver the European Green Deal^{xvi}. The presence of ICT capability to capture and trace these value generation mechanisms will also be evaluated. For example, the use of technological innovations (whether or not generated within the innovation ecosystem) such as property technology, IoT applications, AI & blockchain solutions, etc.

The study is anchored in the analysis of a variety of leading innovation districts throughout Europe that have been set-up as Public Private Partnerships. The team responsible for conducting the exercise (composed of international experts) is analysing a variety of cases and diversity in geographies, sectoral specialisations and stages of maturity. The analysis considers the nature and relationship between stakeholders in every project, the contractual and financial arrangements between partners, the variety of assets, together with the financial and revenue models.

This exercise aims to understand the logic underpinning each individual development and the drivers behind the involvement of all partners. By identifying commonalities and significant differences between innovation districts we want to develop a comprehensive set of criteria that could serve as a framework to support the design and planning of new innovation ecosystems.

An in-depth analysis of value generation mechanisms is meant to identify all potential revenue generating streams and develop adequate metrics for describing and quantifying the positive socio-economic impact of innovation district development projects. An understanding of how and where value is generated is expected to enable the development of an articulated value proposition to mobilise additional investments through the deployment of suitable financing mechanisms and financial instruments.

The results of such an exercise will be delivered at a critical moment for Europe as the continent begins to emerge from the current pandemic and governments grapple with the challenge of allocating massive resources provided by the European Union. Insights emerging from this exercise may, moreover, contribute to mobilising the necessary additionality of private capital to ensure that Europe's recovery is accelerated and long-lasting.

As the continent begins to see light at the end of the pandemic tunnel our research will be the compass indicating to governments, investors and other stakeholders the direction in which they should be headed next^{xvii}.

ABOUT THE AUTHORS

Filippo Addarii

Filippo is an international expert in impact investing and aligning public and private interests through partnership. Co-founder and managing partner of PlusValue, a boutique knowledge-company combining together systemic innovation, societal impact and new business models, he has brought transformational thinking to institutions' policymaking, to banking practice and to major urban regeneration projects. Filippo is a staunch internationalist serving as an independent advisor to the European Commission, European Investment Bank, UN Agencies (and the British Government), and has been assisting the international urban developer Lendlease to pilot a new regeneration model driven by a combination of innovation, sustainable development and social progress; being MIND – Milan Innovation District the flagship project. His academic affiliation is with UCL Institute of Finance and Technology.

Alan Barrell

Alan started working life after studying Biology with six years living and learning in the front-line at a General Hospital in the UK – based in clinical laboratory medicine. He migrated to the health care industry and spent twenty years there with a major US based medical products company and ended that career period as CEO of a significant part of the company in Europe. Subsequently he has worked for fifteen years as CEO in industrial electronics and seven years in early - stage technology venture capital. For the past twenty years he has spent substantial time in China and focussed on cross border technology and knowledge transfer involving UK and China and Northern European markets and the Baltic States. His primary focus is on innovation and the commercialisation of research – especially in life sciences and environmental sectors. Special interest in Innovation Districts. Presently a director in four early stage companies.

Alessandro Fazio

Alessandro Fazio started his career in investment banking with Deutsche Bank and then Merrill Lynch. He also spent a number of years working in the early - stage investment sector in connection to a wide range of technologies and industries.

Alessandro has a keen interest in technology transfer and in how to support the growth and expansion of innovation ecosystems through structured public-private cooperation delivering tangible benefits for the economy and society.

Alessandro joined the European Commission in 2011 and currently acts as head of the Joint Research Centre's Competence Centre on Technology Transfer (CC TT).

Martin Hinoul

Martin holds a PhD in physics and a postgraduate degree in business from the University of Leuven. He joined Bell Telephone Manufacturing Cie (ITT) where he was involved in the development of the first digital switch (System 12). He was also involved in the transfer of System 12 to the PTIC in China. He became Belgium's first technology and science attaché in the United States (Los Angeles and Washington D.C.).

He later joined KU Leuven R&D, the Leuven Technology Transfer Office.

He became chief of staff of the Flemish minister of Economy.

He later returned to KU Leuven as an independent advisor.

Sheron Shamuilia

Sheron holds a PhD in semiconductor physics and a postgraduate degree in corporate finance from the University of Leuven. After working as a post-doc researcher in sustainable material management, she was involved in technology transfer, R&D tax and grants incentives and new partnership scouting and building. In 2019, she joined the European Commission's CC TT, where she focusses on Innovation Ecosystems & Capacity Building.

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