CHAPTER 6

Science Parks and Place-based Innovation

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6.1 Introduction

Science and technology parks (STPs) are an instrument to boost the knowledge-intensive development of places. They have been established already in the 1950s in the United States, with the initial aim to foster the commercialisation of university research. Subsequently, regional planners have integrated STPs in many countries in the portfolio of regional development tools, keen to follow the models of Silicon Valley and the Stanford Industrial Park (Saxenian 1996). Their objective was to organise regional development around science-based growth poles by stimulating

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economic diversification away from declining industries. In response to these regional development goals, European Union Cohesion Funds have been called to support the establishment and the development of STPs. National initiatives have also supported STPs to attract inward investments and create development poles either in central urban areas or in the urban periphery connecting with the *hinterland*.

Today, STPs are present in many European regions: they concentrate a wide range of innovative companies and research organisations, and as a consequence the overall knowledge intensity of these places is very high. STPs are thus likely to include seeds for the domains of knowledge-intensive specialisation, on which regions can rely to increase their competitiveness. This is why STPs seem well placed to play a key role in place-based innovation policies. They are particularly relevant for Research and Innovation Strategies for Smart Specialisation (RIS3) in the European Union, where novel legal requirements introduced the need for regional and national authorities to strategically prioritise the most promising domains in 2013.[1]

But what could this role of STPs consist of? And what are the challenges faced by STPs willing to bring their contribution to—and benefit from—smart specialisation strategies? This chapter provides responses to these questions based on the exploitation of existing knowledge with respect to the role of STPs in regional development.

Section 6.2 highlights the diversity of STP models. It discusses the findings from empirical research about the success factors of STPs in influencing regional development paths, linking this to the various STP models. The existence of different STP models suggests that there might be different answers to the question of the role of STPs in smart specialisation, as some models might better fit smart specialisation objectives than others.

Section 6.3 discusses the specific challenges of smart specialisation and relates these to the understanding of STPs' role in knowledge-intensive regional development. Three key roles for Science Parks in the design and implementation of smart specialisation strategies are proposed:

[1] Foray and Van Ark (2007), in a Policy Brief of the KfG Expert Group, argue that "smart specialisation" in research, at the level of countries or regions, holds considerable opportunities for facilitating agglomeration and excellence which in themselves may make the EU a more attractive destination for R&D investment. What is implicitly proposed here is a shift from the traditional (almost) thematically/regionally neutral and "generic" orientation of R&D funding instruments to a thematically/regionally focused one. The rationale behind "smart specialisation" has to do with avoiding duplication in thematic orientations between geographic areas. To counter duplication, they argue, regions with similar thematic aspirations may engage in "smart specialisation". Source: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC51665/jrc51665.pdf

1. STPs may provide an adequate innovation ecosystem for the development of pilot innovation initiatives, well in line with the entrepreneurial discovery process that should drive the regional economies towards new, distinctive and competitive domains of activities.
2. STPs can play an important role as one of the relevant stakeholders forming the quadruple helix of innovation actors shaping smart specialisation strategies.
3. STPs can add the needed external and outward-looking dimension to smart specialisation strategies, a dimension that is today still very much under-developed.

These contributions from STPs cannot be taken for granted though. We identify limitations and success conditions for each of the three roles.

Illustrative examples of STPs from Finland, England and the Netherlands are provided in Sect. 6.4.

The concluding section spells out a new agenda for STPs, in view of making the most of their potential contributions to smart specialisation strategies across European regions and states.

6.2 The Role of Science Parks in Regional Innovation Strategies

6.2.1 The STP Concept

Given the long history of STPs, it is not surprising that the concept has given birth to a diversity of different models in practice. Differences stem from their origins, driving forces and territorial contexts in which they have been established. The core elements of the concept are encapsulated in the definition adopted by the International Association of Science Parks and Areas of Innovation (IASP):

> *A Science Park is an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a Science Park: stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities.*

From this definition, we can infer five key elements that characterise STPs:

1. A localised economic development goal;
2. A focus on fostering science-industry relationships;
3. A priority placed on innovative and technology-based activities;
4. The provision of value-added services to companies;
5. A property-based initiative.

The difference in priority among these elements in design and operation generates a wide diversity in Science Park models:

- Some STPs concentrate on property management, while others have developed a wide range of professionalised "soft" business support services;
- Depending on their funding model, some STPs may prioritise the commercial viability of the property, possibly using less strict criteria for accepting firms, while others put a higher premium on high technology and potential for knowledge exchange between tenants;
- Partly due to their history but also in line with the environment in which they are located, a number of STPs connect mostly to global actors with few relationships with their regional environment, while others are key regional players with their tenants being deeply embedded in the regional innovation ecosystem;
- The presence or absence of a top level research institution or university at the core of an STP and the strategies pursued by these institutions in terms of their third mission (service to society) influence the nature and depth of science- and research-driven relationships within STPs;
- Finally and most importantly, depending on the thickness of the regional innovation support environment, some STPs serve as central innovation agencies in their regions, while others are just one instrument amongst many others that are available in a territory for the support of knowledge-intensive development.

This diversity of models generated by these differences in STP strategies, combined with differences in size, nature of tenants and funding models, has to be taken into account when discussing the role of STPs in regional development as a whole and in smart specialisation in particular.

6.2.2 *Science Parks' Role in Knowledge-Intensive Regional Development*

The role of STPs in regional development can be discussed according to two different approaches, a linear or an interactive one (Table 6.1). While such a dichotomy is helpful from a conceptual perspective, in practice, STPs hold features that belong to the two stylised models. Recent developments show that an evolutionary process is at play, in which STPs evolve from being "bridges" towards becoming "clusters of competences" at the heart of regional innovation ecosystems.

The linear view sees STPs mainly as instruments of technology transfer, emphasising their role in supporting research-based commercialisation. In this understanding, the role of STPs is mainly to act as facilitators in these exchanges, as a bridge from knowledge sources to recipients. To this aim, STPs offer place-based transfer services addressing the gap between the business and scientific communities.

In contrast, in an interactive approach to STPs, the overall innovation environment plays a key role in the operation of STPs. Here, STPs are seen as nodes in wider networks of actors supporting innovative business development. Technology transfer is only one of the ingredients of successful innovation, and the knowledge exchanges take a multi-dimensional character rather than a science-to-business direction. The aim of STPs broadens to a mission of supporting innovation cocreation. An interactive vision of STPs, thus, reflects a much broader role for this instrument in regional development.

Any assessment of the actual success of STPs on the development of their environment is obscured by the lack of consensus on their expected benefits. Typically, universities would expect an impact in research

Table 6.1 A stylised view on STPs: Linear versus interactive model

Linear model: STPs as bridges	*Interactive model: STPs as clusters of competences*
Technology transfer	Dialogue creation
From source to recipient	Multilateral exchanges
A specific place	A node in a system
Focused support	Multiple support
Material support	Learning support
In-house support	Clearing house
Technology gap	…and managerial gap

Source: Own compilation based on Nauwelaers (2009)

commercialisation. Private investors seek return on investments in commercial premises, while regional authorities will look for wider regional development effects such as new companies and new jobs created as well as various other spill-over effects on their economic activities.

It is generally acknowledged that the main benefits of STPs are found in the following areas (European Commission 2008):

- Increased place visibility and attractiveness, conferring a high-tech image to the region where STPs are located. This improved image can play an important role for attracting talent and investors, and for creating good conditions for accessing a pool of high-skilled talents;
- Increased competitiveness of businesses through:
  - Provision of adequate infrastructure (including Information and Communication Technologies) for research- and technology-intensive businesses, which can be shared with public research organisations and universities located in the STP;
  - Provision of a range of tailored business support services targeting specific categories of firms and high-tech businesses. Theme-oriented STPs (on ICT, life science, etc.) may have more opportunities for developing specialised services (intellectual property rights, management support, technology brokering, etc.) and for attracting a critical mass of professionals specialised in these areas.

The creation of a stimulating milieu for the informal exchange of tacit knowledge amongst firms, and between firms and research organisations, which contributes to high levels of social capital, is another alleged benefit from STPs. In theory, being located in an STP populated with knowledge-intensive actors from different sectors and technology fields provides great opportunities for innovative combinations and cross-innovation. This type of qualitative effect is, however, much less straightforward to demonstrate than those previously stated. Several studies generated disappointing conclusions on the intensity of the internal networking effects of milieus in STPs. A review of the vast literature dealing with impacts of STPs on their environment is largely inconclusive (OECD 2011):

- Some studies find that the correlation between STP presence and intensity of high-tech development is due to third factors, such as urban density;

- The additionality of STPs is also questioned, since they may gather high-tech businesses that are present in a region anyhow rather than provide new conditions for their development. STPs may be a reflection of the quality of the innovation environment rather than a factor driving innovation. Tautological results are also frequently found in studies that underline the fact that STPs are more successful in more advanced regional environments;
- Studies that have found a correlation between the high performance of firms and their location in STPs have often restrained from claiming that STPs increase innovation performance. A selection bias is likely to explain the difference of performance between on- and off-park companies. Some studies have also found little difference in firm performance and survival rates between matched pairs of firms on- and off-parks.

We can conclude that STPs, while providing a favourable and potentially fertile environment for innovative firms, are not automatically generating such positive impacts for regional development.

Recent research has gathered evidence that STPs play an important *additional* role in regional development: their tight integration in the regional ecosystem and close interaction with, and complementarity to, regional innovation support instruments. This is well in line with the interactive model depicted before, in contrast with the narrower linear model of STPs. As expressed by Rowe (2013), a new model for STPs seeking to foster an innovation agenda benefitting their regional environment is visible when they:

- *Are seen as an integral part of the local innovation ecosystem that understand and work with it and also design and deliver programmes that reduce weaknesses in the innovation ecosystem. STPs may also create collaboration spaces to bring innovation actors together and act as host to the programmes of other actors as a means for increasing the visibility of the entire innovation ecosystem.*
- *Balance the need for short-term financial returns to secure sustainability against the opportunity to accelerate innovation-led business and economic growth. Where the public sector is involved in an STP, the subsidies and grants they provide serve as 'patient money' allowing the STP time to secure its economic development objectives as well as financial sustainability.*

– *Engage with the private sector to secure capital for development as the park proves they can attract inward investment (both national and international) and / or the park stimulates new innovation-led business activity in other ways, often involving partners in the process. Where the demand from new technology businesses in a locality is already strong the private sector may well take the initiative alone in creating an STP.* (Rowe 2013)

It follows from this view that STPs can play an effective role in regional development when they are part of a policy mix for regional innovation, including other elements necessary for innovation support such as: funding programmes for collaborative research (thematic or not); mobility schemes; various types of support for entrepreneurship and the creation of new technology-based firms; venture capital and other types of funding sources for knowledge-intensive business and so on.

Other important success conditions are rather internal to STPs and concern the strategy of the STP management and their main tenants:

1. The provision of "integrated policy mixes", offering more effective support for innovation; coupling real estate services with innovation support in broader sense is a strategy that is more effective than the provision of fragmented support (Nauwelaers et al. 2009).
2. The role of a professional management team cannot be overemphasised as a success condition for the contribution of STPs to knowledge-intensive growth. The development of a strategic vision is central to this role, since it solves tensions between conflicting objectives and helps to adapt all services to one shared vision.
3. The connection to other off-site actors and the presence of an internationalisation strategy is more and more recognised as a key element for STPs and their role in innovation support, while in the past most attention was traditionally paid to internal on-park interactions.
4. Since higher education institutions and public research organisations are frequently present in STPs, the contribution of these actors needs also to be maximised: the role they want to play and their strategies in terms of their "third mission" is a key factor in leveraging the potential of public research assets (people, infrastructures, networks) for the wider benefit of STP tenants and the surrounding environment.

5. Similarly, large firms located in STPs might pursue open innovation strategies which are conducive to the development of fruitful in- and off-park interactions. Multinational companies which are footloose provide a much weaker asset for turning an STP into an effective regional development tool.

6.3 STPs' Role in Smart Specialisation

In the previous section, we argued that STPs can play a positive role in fostering localised knowledge-intensive growth, when they are embedded in their regional (policy) environment and develop their strategies with this goal in mind. In the current period (2013–2020) of EU funding for regional development and innovation, new regional development policies have evolved following the smart specialisation concept.

Since 2013, EU member states and regions have developed and implemented RIS3 to ensure an effective use of European Regional Development Funds (ERDF). These national or regional RIS3 set a limited number of priorities and build competitive advantages by developing and matching assets in research and innovation with business needs to address market opportunities, whilst avoiding duplication and fragmentation of efforts. In other words, RIS3 are integrated, place-based economic agendas that build on national and regional assets, strengths and potentials, and focus on a limited number of priorities to stimulate growth.

Smart specialisation is not limited to research-based innovation: it also aims at innovation not embedded in science, such as social innovation, innovation in the public sector, innovation in creative industries and service innovation. The very aim of smart specialisation is to create jobs in growth sectors, for example by stimulating entrepreneurship and collaboration between education and research institutions and the private sector. It is meant to promote partnerships within quadruple helix arrangements (public entities—knowledge institutions—businesses—civil society), as well as to address grand societal challenges such as ageing society, social inclusion, environment and climate change. The RIS3 are currently being implemented and monitored with the involvement of national or regional Managing Authorities as well as local stakeholders including universities, industry and social partners. Smart specialisation thus offers a great opportunity and responsibility for STPs to shape the future of their home region or country.

According to the proposal from the European Commission, the next EU budget starting in 2021 will expand the idea of smart specialisation as "enabling conditions" for an effective investment of ERDF.[2] Under this proposal, every region and member state will have to fulfil the following seven enabling conditions:

1. Up-to-date analysis of bottlenecks for innovation diffusion, including digitalisation;
2. Existence of competent regional/national institution or body, responsible for the management of the smart specialisation strategy;
3. Monitoring and evaluation tools to measure performance towards the objectives of the strategy;
4. Effective functioning of entrepreneurial discovery process;
5. Actions necessary to improve national or regional research and innovation systems;
6. Actions to manage industrial transition;
7. Measures for international collaboration.

Thus, smart specialisation enshrines strategic innovation as a core element of regional development policy. It was a novel ex-ante conditionality that required policy-makers to design evidence-based innovation strategies focusing on a limited number of innovation priorities and informed by a broad and continuous involvement of stakeholders. Continuous policy learning and an "entrepreneurial discovery process" with all relevant stakeholders are important elements of this legal requirement for the use of ERDF.

How can STPs address the specific challenges linked to smart specialisation design, implementation and monitoring? Three proposals for the role of STPs in smart specialisation are developed below and discussed in the following subsections.

The first and most obvious bottleneck in smart specialisation relates to the prioritisation of those domains of activity that are likely to create the

[2] Proposal from the European Commission COM (2018) 375. Article 11 of the proposed Structural Funds Regulation details the characteristics of the enabling conditions and refers to Annex IV of the Proposal for further information on the thematic fulfilment criteria. Current Thematic Objective 1: Research, Technological Development and Innovation will be turned into Policy Objective 1: A smarter Europe by promoting innovative and smart economic transformation and will focus on: Good governance of national or regional smart specialisation strategy.

basis for future regional development. How to detect those fields in a bottom-up fashion, relying on an entrepreneurial discovery process that is mostly driven by companies but also nurtured by the contributions of knowledge institutions and other regional actors? Our argument here is that STPs of a "new generation" could serve as ecosystems for experimentation and demonstration of innovation pilots, thus contributing to the smart specialisation entrepreneurial discovery process (see Sect. 6.3.1).

The second challenge for smart specialisation is the engagement of a wide range of stakeholders, both at the design and implementation stages of the strategy. This is needed to secure the endorsement of the priorities by the main innovation actors and an adequate delivery of policies in line with the specialisation priorities. This is why we argue that STPs have the potential to be key actors in the regional quadruple helix for smart specialisation (see Sect. 6.3.2).

The third, and less widely acknowledged challenge for smart specialisation, is to develop the external dimension of the strategy. When priority domains are defined for place-based innovation, regional actors need to assess their position in European and international value chains and to identify complementarities with external actors outside their region and country. This requires taking strategic lines of actions to connect to these international actors and networks, as well as to support the building of regional actors' absorptive capacity. Today, regional development strategies are too much inward-looking. Our final argument is thus that STPs can help opening up smart specialisation thanks to their own external networks. We discuss this aspect in greater depth in Sect. 6.3.3.

6.3.1 STPs as Ecosystems for Experimentation and Demonstration of Innovation Pilots

Smart specialisation in a region is not about picking "winning sectors". It is rather about fostering the identification of new, original and distinctive areas of activities, which have the potential to transform the economy of a region. What becomes important here is the capacity of innovation actors to identify new business opportunities, tapping on their core competences and combining them with other skills and knowledge inputs, to create such new combinations. In this process, proximity can play an important role in facilitating exchange of tacit knowledge through face-to-face interactions.

STPs are characterised by an important concentration of knowledge-intensive activities and by the availability of a variety of high-level skills. This is a fertile ground for developing experimental innovation-oriented initiatives. However, this will only happen if (1) internal connectivity is high within a favourable ecosystem in the STP facilitating the creation of new, unexpected combinations leading to innovation, and (2) the STP ecosystem is well embedded in the wider regional ecosystem, where other skills and resources can be accessed. Globally speaking, almost 40% of STPs are generalists in terms of the economic and technology domains they cover (IASP 2018, 42). Only one quarter is highly specialised. Higher degrees of specialisation focus efforts and can thus facilitate linkages to the wider ecosystem.

This role of STPs is even more demanding in the context of smart specialisation: new and distinctive, regionally based competitive activities are likely to be found at the *intersection* of sectors and clusters, rather than within traditional sectors. In this understanding, STPs are promoters of "related diversification", an aspect that needs increased attention to:

- Services provided by STPs need to be well-tuned to the needs of existing clusters, but also to those of "informal clusters", that is, groupings of companies according to various types of interests, also outside of their traditional lines of activities.
- Traditional clusters might indeed not be the adequate target audience for STP services, if they do not promote cross-cluster innovation. Cross-cluster innovation and the creation of new activities across sectoral silos is a central element of smart specialisation.
- Practice-based innovation needs to receive new attention, in addition to the more traditional "technology push" types of service activities delivered by STPs.
- On-park innovation pilots, exploiting combinations of tenants' (and other actors') assets, are good testimonies of the success of a Park's strategy. But attention should be paid to the scalability of the pilots, in view of their contribution to regional growth.

STPs' challenges in becoming such fertile ecosystems are manifold, but two issues stand out:

- Funding: engineering a variety of EU, national and regional funding sources and from various policy domains (research, business development, environment, land planning, etc.) is needed to support

innovation in an integrated way. Beyond the public funding question, a high share of private investment in services and operation of STPs is the best guarantee for success. And the new role of STPs places an increased focus on the need for "patient capital" to support new, risky endeavours.

- Talent: the main fuel for the knowledge ecosystem in and around an STP is human capital, in the form of a skilled, adaptable and mobile workforce. Talent attraction and retention may well be the most important new strategic direction for new STP models in line with a new generation of regional innovation policies.

6.3.2 STPs as Key Actors in the Regional Quadruple Helix for Smart Specialisation

As Foray (2016) put it, the entrepreneurial discovery process is essential for smart specialisation. It is a process in which a large number of local agents including firms, research centres, independent inventors and lead users are involved in making informed decisions on a limited number of smart specialisation domains. Embedding a wide range of regional stakeholders is a key success factor of smart specialisation strategies. Reaching companies is often the main hurdle in this endeavour, because they are not easily mobilised around policy-oriented exercises. Thanks to their close relationship with companies, STPs have the legitimacy to act as an interface in these partnerships, representing the voice of innovative companies. However, maintaining this type of interaction is not an easy job: it requires a high strategic profile, strong legitimacy and credibility from STP managers. And it is also not likely to occur automatically: managers must have a pro-active, constructive attitude in order to make their voice heard in policy-making circles.

Involving stakeholders in smart specialisation processes should, however, not turn into a competition between the "voices" of various regional actors, with those having the strongest voice becoming the winners. Instead, it is an orchestrated exchange of views, in which various regional stakeholders bring in their own contributions, but also undertake a search for new, emerging fields, where critical advantages can be built. STPs are well placed to contribute to these efforts, if they can demonstrate a genuine contribution to the smart specialisation process and content.

Stakeholder involvement in smart specialisation builds on the idea of quadruple helix, which refers to government institutions, universities and

research organisations, industry and civil society as key actors in innovation ecosystems (Carayannis and Campbell 2009). The role of STPs in the regional quadruple helix is likely to differ according to three elements:

- Density of the regional innovation ecosystem: in denser ecosystems and/or more developed regions, STPs are more likely to be only one amongst many legitimate stakeholders participating to smart specialisation. At one extreme, STPs may deliver most innovation services themselves, acting like regional innovation agencies, or, at the other extreme, be a small operator within a range of powerful bodies and agencies with whom they need to coordinate. In between the two extremes, STPs can also sometimes take a role of orchestrators of a regional/national network of service providers.
- Scope and scale: smaller STPs may not get a sufficient level of visibility and legitimacy to play an important role in the quadruple helix. In regions where several STPs are present, complementarity and joint efforts are required to enhance their effectiveness.
- Institutional linkages with regional authorities: when STPs benefit from regional public funds, either structurally or on a project basis, they are likely to have more direct and more in-depth interactions with regional policy-makers and other constituencies in charge of smart specialisation.

6.3.3 External Connectivity of STPs: Outward-Looking Territories and Smart Specialisation

While countries and regions develop methodologies to explore and understand their own local assets, their strengths and opportunities, they often struggle to strategically identify opportunities for cross-border, transregional and transnational cooperation. One possible step is to analyse and map the situation of the identified national/regional priorities in wider value chains. Transnational and international STP activities should be exploited to link to global networks and connect to foreign partners active in related activities.

An outward-looking dimension and connectivity are essential features of designing and implementing innovation strategies for smart specialisation, at both design and implementation stages. During the RIS3 design stage, the external networks maintained by STP stakeholders can be activated to feed into smart specialisation strategies and help define those

areas of specialisation to be targeted as regional priorities; an STP network can also provide access to experts in international innovation strategies and activities. During the RIS3 implementation stage, communities of actors in STPs can act as living labs for developing innovative products or services, and these need to be open and well connected to external sources of ideas and knowledge. Such open living labs can constitute a core element for the implementation of smart specialisation strategies and inform a continuous entrepreneurial discovery process.

At the same time, interconnectivity is essential for STPs for a number of reasons. (1) Networks provide an access to resources including financial resources, human capital and knowledge. Since STPs support their associated stakeholders by ensuring a highly innovative environment, business opportunities and favourable working conditions, access to these network resources can add substantial value. STPs also have to attract resources from the outside, and this is significantly facilitated by their networks and external partners. As STPs connect to other science parks and partners in EU countries and worldwide, they could be even more encouraged to explore their collaboration opportunities in other regions and (neighbouring) countries, for example, by connecting to existing clusters across borders, using international innovation vouchers or promoting joint participation in R&I programmes and schemes. (2) STPs seek to increase their firms' and stakeholders' access to markets. This, of course, requires solid knowledge of these markets and the opportunities elsewhere. (3) STPs advocate and lobby for their partner stakeholders. The impact of these activities is higher when they are made through international networks and in coalition with international partners.

To get an impression how regional and national innovation priorities in Europe compare with the thematic focus of STPs across the world, Tables 6.2 and 6.3 show the specialisation domains of digital transformation, key enabling technologies and health. In these domains, STPs are globally active, and European STPs and the regions in which they are embedded can use their joint networks for thematic collaboration.

In sum, STPs with a sound internationalisation strategy can act as bridging agents with targeted actors outside their host region, helping to embed regional actors in wider networks and value chains. Regional, national and international networks of STPs (including the International Association of Science Parks) have an important role to play in supporting the outward-looking dimension of smart specialisation.

Table 6.2 Top specialisations of STPs worldwide

STP specialisation	*Share of surveyed STPs*[a]
ICT & communications	64%
Biotechnology	35%
Computer science & hardware	32%
Electrics	29%
Software engineering	29%
Health & pharmaceuticals	27%

Source: Authors' creation based on proprietary data from the International Association of Science Parks and data from the European Commission's Eye@RIS3 database at http://s3platform.jrc.ec.europa.eu/eye-ris3. Accessed May 13, 2019
[a]The shares add up to more than 100% because many STPs have several specialisations

Table 6.3 Top smart specialisation priorities in European countries and regions

Innovation priorities in European regions and countries[a]	*Share of priorities*
Digital transformation	27%
KETs	18%
Sustainable innovation	17%
Public health & security	14%
Blue growth	7%
Cultural & creative industries	5%

Source: Authors' creation based on information and data from the European Commission's Eye@RIS3 database at http://s3platform.jrc.ec.europa.eu/eye-ris3. Accessed May 13, 2019
[a]The categories are based on EU-wide objectives approximated through the definition of priorities in national and regional strategy documents (n = 809 priorities) (European Commission 2008)

6.4 Examples of STPs from a Smart Specialisation Perspective

The three cases of STPs presented in this section illustrate different models and different types of potential STP contribution to smart specialisation in the predominant specialisation domains presented in the previous section.

6.4.1 The Finnish Joensuu Science Park: Taking on a Leadership Role in Smart Specialisation

Joensuu is the capital of Finland's easternmost province in North Karelia. It is located close to the Russian border, about 400 km from Finnish capital Helsinki. Joensuu is a centre for trade, culture, education and technology.

Three higher education institutions—the North Karelia University of Applied Sciences, the University of Eastern Finland and the HUMAK University of Applied Sciences—are based in Joensuu. The main industry sectors are metal, wood and forestry. Joensuu hosts strong research actors in forestry, including the European Forest Institute and Joensuu Science Park.

The Joensuu Science Park has been established in 1990 and is part of the Finnish Centre of Expertise programme. It has specialised expertise in nanotechnology, future forestry industry, building technology and energy technology. The main goal is to promote the commercialisation and use of research and new information in the business operations of companies. Joensuu Science Park Expert Services support companies in planning, developing, executing and monitoring strategy-based development programmes. To this end, it offers an integrated package of services covering all aspects of innovation.

Due to its central position in the knowledge-intensive economy of the region, the Science Park acts as an orchestrator of regional resources for the definition of a joint vision concerning growth choices and the principles behind them. A strong principle behind the strategy is the identification and stimulation of interfaces and intersections of the technologies and industries selected in the strategy. The Science Park is well placed to engineer such a vision. Thanks to their involvement in the definition of a joint vision and the elaboration of the regional smart specialisation strategy, the organisations involved in the platform created by the Science Park are committed to the choices made and the implementation of the measures. Three strategic domains of activities have been chosen: (1) Forest bio-economy; (2) Technology and materials; and (3) Creative industry and experiential content production. This priority setting was based on the following criteria: sufficient competence that meets high international standards; current significance to the regional economy; expectations concerning development and growth potential; special attention given to cooperation and interfaces between the focus areas.

The success of the regional smart specialisation strategy will be assessed according to the following indicators:

1. Development of revenue, export and jobs in the businesses operating in the focus areas;
2. Number of businesses founded in the focus areas/relocating into the region;

3. Amount of education organisations' internal and external funding for research and development in the focus areas and increase in the number of researchers and graduates;
4. Amount of public funding granted to the development of the focus areas by the North Carelia's Centre for Economic Development, Transport and the Environment, and Tekes, the Finnish funding agency for innovation;
5. Investments in the development of the focus areas, as calculated by the Joensuu Science Park Ltd. and Josek Ltd., a service provider to companies in the region.

6.4.2 The UK North East Technology Park (NETPark): One Actor in the Wider Innovation Ecosystem

NETPark is located in County Durham in the North East of England. This is a county which has diversified from the declining mining industry towards manufacturing and engineering, which accounts for about 20% of its economic base. The North East of England is home to four universities, including Durham University. Durham University's research covers fields such as nanotechnology, bio-science, electronics, chemistry, astronomy and engineering. Business Durham is the county's economic development company, delivering support for business and economic growth. NETPark is one of Business Durham's integrated portfolio of interventions, along with strategic account management, inward investment, enterprise and outreach. See Table 6.4.

The definition of the innovation priorities for NETPark builds on the strengths of Durham University and on the wider existing capabilities in North East England. NETPark focuses on supporting companies that are developing new technologies and products, particularly printable electronics, microelectronics, photonics and nanotechnology, and their application in the fields of energy, defence and medical-related technologies. One particularity of NETPark is that it brings its services also to companies and actors which are located outside the park. The set of indicators used to measure the park's success reflects the concern about the impact on the wider regional environment.

Table 6.4 Hierarchical indicators for assessing NetPark's success

Position in hierarchy	*Objective*
1	Increased GVA by occupants in NETPark
2	Increased employment
3	Increased GVA per head
4	Increased number of technology-based companies in county/region
5	Attraction of firms from other parts of the UK and abroad
6	Increased exports
7	Exploitation of technologies
8	Attraction of investment funds (including bank and venture funding)
9	Technology exchange work with universities in the north east and between companies
10	Retention of graduates from regional universities
11	Employment of local people
12	Raising employment aspirations amongst pupils studying STEM subjects in schools

Source: Authors' creation based on a presentation at the International Association of Science Parks – Joint Research Centre workshop, February 19, 2014

To underscore the uniqueness of some of the region's assets, NETPark has successfully argued for branding one of the smart specialisation innovation priorities as "surface science". This has the advantage that outside investors, researchers and interested parties can more easily recognise a particular niche that North East of England specialises in. The interaction of surfaces—air to air, air to liquid, air to solid, liquid to liquid, liquid to solid, solid to solid—encompasses some truly world-class university research, the two biggest corporate R&D hubs in North East England, existing innovation hubs and significant numbers of SMEs. It can be both broad and narrow. The broadness enables the North East to tie a number of seemingly disparate activities into a critical mass in order to be able to compete globally. It can be narrow in terms of enabling specific activities such as pharmaceutical, filtration, materials and electronics, among several others, to grow and thrive. Although not directly responsible for developing the regional RIS3, NETPark was able to use its networks and influence, working closely as a credible and respected partner with the North East Local Enterprise Partnership, to ensure that this vital area was included.

6.4.3 Brainport Foundation and High Tech Campus Eindhoven: Ensuring the Commitment of Businesses Towards a Cross-Border Top Technology Region

Brainport can be characterised as a "horizontal triple helix collaboration" partnership, since large companies and SMEs, knowledge institutes and governmental organisations collaborate at various levels in the Dutch region of Noord-Brabant (Wintjes 2011). Out of all triple helix parties, the provincial government is perhaps the least dominant and most limited actor in terms of resources. The project management approach builds on the model of the former EU-funded research project which consisted of a large number of bottom-up initiatives with external project owners. Brainport tries to persuade the involved firms or knowledge institutes to take ownership of individual initiatives or projects. For this innovative approach, Brainport Eindhoven has won the Eurocities Award 2010 in the "cooperation" category for their very promising cooperation amongst companies, knowledge institutions and government.

One of the key actors in the Brainport region is High Tech Campus Eindhoven. The establishment and continuous growth of the Campus is the result of efforts by several (collaborative) partners, with Philips as initial core partner, promoting open innovation practices in and around the campus. These parties' aim is to develop the Eindhoven region as an internationally recognised technology region with the Campus as central high-tech hub for the entire Dutch, German and Belgian cross-border region. The Campus is at the heart of one of Europe's leading R&D regions: the Eindhoven, Leuven, Aachen triangle (ELAt) is an area that has acquired a strong European position in microelectronics/nanoelectronics and life sciences. Campus companies are responsible for nearly 40% of all Dutch patent applications.

In line with the limited role of public government and public R&D investments, the innovation system of the region is privately driven, although public-private initiatives like Holst Centre and Solliance play an important role. The development of the innovation strategy was led by the former vice president of the multinational company DSM, and the steering group also included a former manager of Philips. In line with the approach of Brainport to appoint external people as "project owners", many initiatives and projects are led, or "driven", by businessmen. Private companies like Philips have become important actors in the governance of RTD policy in Noord-Brabant. Within ten years, High

Tech Campus Eindhoven has developed into a dynamic mix of more than 125 organisations from global brands, leading research institutes, fast growth enterprises, service companies and high-tech startups with a large impact on the innovation performance of the region. With accelerator programmes like Next OEM, Startupbootcamp HighTechXL and two European Knowledge Innovation Communities (EIT Digital and EIT InnoEnergy), companies, investors and innovation intermediaries became more involved in the further development of the Campus by providing incubation support. The Campus model of open, collaborative innovation has been adopted and implemented also elsewhere in the region.

The regional innovation strategy, "Brainport 2020: Top Economy and Smart Society", has been elaborated as a response to the request from the national government. It includes a vision, a strategy and a tangible implementation programme. The assignment was to "develop … a cohesive and comprehensive vision of Brainport, at the level of Southeast Netherlands with Brainport as pivot and with a focus on cross-border links to Flanders and Nordrhein-Westfalen". Brainport thus is a prime example of how a science and technology park can use its external connectivity as a strategic asset.

6.5 Conclusions: The Changing Role for STPs in the Smart Specialisation Era

Smart specialisation strategies constitute a turning point in the young history of regional and place-based innovation policies. They address the main development bottlenecks faced by European regions, namely (1) lock-in in outdated specialisations and in industrial structures which are not conducive to growth and employment, and (2) top-down approaches, which often overlooked place-based needs and capabilities. Smart specialisation adopts a place-based, bottom-up perspective pursuing regional economic transformation, as opposed to continental-scale planning from above.

The ambition of these strategies is high and an orchestrated contribution from all innovation actors in regions is needed to reach these goals. This cannot be achieved in a top-down manner. Science and technology parks are by definition place-based organisations that are active in many regions. Among the quadruple helix actors, these organisations stand out as suitable candidates to play a forward-looking role in the

regional innovation partnerships, provided they support innovation experimentation. Yet, this does not give science and technology parks an automatic place in smart specialisation governance. This place has to be gained based on the credibility of these organisations and the quality of their contribution for developing specialisation domains. Misuse of strategic position by means of, for example, lobbying for scientific/technical areas of their interest with the objective to secure public funding can be harmful for the process and the needed regional economic transformation.

To support smart specialisation strategies, science and technology parks should act as *boundary openers* at several levels:

- Internal to STPs: they can foster unique and innovative combinations between the assets present in the park, but also in the regional environment;
- Interregional and international: STPs can activate their international networks to reinforce the external connectivity of smart specialisation;
- Intersectoral: STPs can foster linkages and related variety between sectors and clusters where a critical mass already exists.

This creates a new agenda for STPs, which will require the development of sound strategic skills for STP managers. In particular, this involves:

- A vision geared towards economic value creation and innovation ecosystem support, seeing STPs as "smart innovation intermediaries" rather than as real estate managers only;
- The adoption of a long-term perspective in the delivery of services and the definition of priorities in the STP strategy;
- Filling an important gap in terms of monitoring and evaluation of STP actions, seeking to achieve outcomes such as:
  - improvements in the ecosystem that are linked to the STP's activities;
  - *additional* value creation thanks to "STP effects" (thus taking into account any displacement effects);
  - long-term sustainability and the capacity of attracting private funding for the STP.

Ultimately, when all favourable conditions are met, STPs have the potential to play an important transformative role in regional economies.

A critical avenue for further research and experimentation relates to the development of suitable indicators to track the effective contribution of STPs to place-based innovation. This goes much beyond the evaluation of the "success" of STPs according to their own objectives, even if this is the primary point of attention for STP managers and funders. It requires a capacity to understand the additional effects of STPs in terms of generating new knowledge-intensive businesses and lines of activities, as well as the quality of internal and external connections generated by the innovation actors connected to the park.

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