SETTING UP, MANAGING AND EVALUATING EU SCIENCE AND TECHNOLOGY PARKS

An advice and guidance report on good practice

October 2013

Regional and Urban Policy

Europe Direct is a service to help you find answers
to your questions about the European Union.

Freephone number (*):
00 800 6 7 8 9 10 11

(*) Certain mobile telephone operators do not allow access
to 00 800 numbers or these calls may be billed.

European Commission, Directorate-General for Regional and Urban policy
REGIO DG Unit G1 - Competence Centre: Smart and Sustainable Growth
Mr Mikel Landabaso Alvarez
Avenue de Beaulieu 1
1160 Brussels
BELGIUM

E-mail: regio-publication@ec.europa.eu
Internet: http://ec.europa.eu/regional_policy/index_en.cfm

Luxembourg: Publications Office of the European Union, 2014

ISBN 978-92-79-37274-2
doi 10.2776/73401

SETTING UP, MANAGING AND EVALUATING EU SCIENCE AND TECHNOLOGY PARKS

An advice and guidance report on good practice

October 2013

FOREWORD

The EU's Cohesion Policy has been supporting research-industry and government collaboration to deliver innovation in their regions for many years. Nearly 25% of the European Regional Development Funds, approximately 86 billion has been invested in research and innovation related activities during the 2007-2013 period.

Strengthening research, technological development and innovation are singled out in the EU2020 strategy, proposed by the European Commission, as one of the leading ways of creating high technology economic development together with high value-added jobs.

Science and Technological Parks play a significant role in knowledge and technology transfer into the market. There are more than 365 such Parks across the EU today, employing 750,000 people, with a total capital investment reaching almost €12 billion. They contribute to regional economic development and facilitate the emergence of new technology-based companies.

Yet the success and potentials of Science and Technology Parks are not uniform. The characteristics of the local economy, the local research base as well as the degree of local partnerships among public and private stakeholders are key components for their success. These local characteristics are firmly embedded in the smart specialisation policy process, which is a a basic principle of the new, reformed, Cohesion Policy for 2014-2020. And it is precisely for these reasons that we have made Smart Specialisation Strategies a condition that has to be fulfilled before any funding on research and innovation is spend from the European Structural and Investment Funds.

This guide underlines the role played by Science and Technology Parks to further develop regional economies and looks at their performance, from the setting-up to the operational phase. Moreover, it provides a compilation of good practices in the field of their management and aims at facilitating public authorities' decision with regard to financial support.

We hope that you find it a valuable tool.

Johannes Hahn
European Commissioner for Regional and Urban Policy

Acknowledgements

The author would like to acknowledge the very considerable help and support received from:

- Members of the department for Smart and Sustainable Growth team within the Regional and Urban Policy Directorate of the EC who clearly articulated their requirements following consultations and were helpful at all times during the preparation and delivery of the final report.
- The International Association of Science Parks and Areas of Innovation – European Division (IASP) in conducting a survey of 129 EU STPs to provide information that could be used in the writing of the guidance report. The work and diligence of Alicia Shelley and Laura Monasterio are acknowledged in particular.
- The expert team established by IASP that reviewed chapters of the report as they were produced including in particular Luis Sanz, Joan Bellavista and Josep Pique. Their constructive views were always apposite and helpful.
- Kathrin Peters, an EU expert in the field, who served as a sounding board, ensured that the section on evaluation was soundly based and contributed widely to the thinking and development of the report and the way that information would be best structured within it.

The author takes responsibility for the views expressed in the report.

Executive Summary

Science and technology park (STP) activity across the EU has approximately doubled over the last 11-12 years, driven by the growth of the longer standing parks and the emergence of new parks. There is now an estimated 366 STPs in the EU member states that manage about 28 million m^2 of completed building floor space hosting circa 40,000 organisations that employ approximately 750,000 people, mostly in high value added jobs. In the period from 2000 – 2012 total capital investment into EU's STPs has been circa €11.7 billion (central estimate). The central estimate of total capital investment on buildings for those EU STPs that secured ERDF was €5.6 billion, of which approximately €1.6 billion was ERDF giving a 3.6 leverage ratio. Approximately 70% of all STP investment made in areas where STPs believed ERDF was accessible to them were assisted by ERDF finance. In addition, during the same period, STPs have expended circa €3 billion on the professional business support and innovation services they either deliver or finance to assist both their tenants and other similar knowledge based businesses in their locality.

Increasingly, the reasons why STPs are sound investments for public sector support are becoming better understood and articulated. The evidence base shows that better STPs are not simply the landlords of attractive and well specified office style buildings. Rather, they are complex organisations, often with multiple owners having objectives aligned with important elements of economic development public policy as well as an imperative to be financially self-sustaining in the longer term.

EU STPs in the 21st Century

Amongst the characteristics displayed across the majority of the EU's STPs that clearly differentiates them from a good quality business park or other pure property investment, are the following[1]; they:

- Operate careful tenant selection policies
- Selectively prioritise the newer knowledge-based technology industries
- Engage with the knowledge base (primarily universities and public research organisations)
- Engage cooperatively with other public and private sector actors
- Own and/or operate one or more business incubation schemes
- Provide professional business support and innovation services designed to increase the depth and extent of innovation-led and knowledge based business in their region or locality as well as within their park.

Academic comparative studies of STPs across regions and nations have shown that there is a link between the apparent success of STPs and the strength and diversity of the local economy where they are founded. In general stronger and more diverse economies with good local innovation ecosystems tend to produce STPs that are generally regarded as amongst the more successful. The research also suggests that well integrated local partnerships working to support and further an STP can compensate for some lack of strength in the local economy but nevertheless there still needs to

[1] See chapter 1 for details

be strength in the local research base to underpin the innovation ecosystem before an STP is likely to flourish.

The above research, when taken together with the theories of triple helix action as a basis for fostering business innovation and the identification of generational development trends in STPs that are leading them towards an increasing engagement with the innovation agenda, have led to the identification of the early 21st century model of STPs that founders and owners are increasingly adopting. That is, a model where STPs:

- 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. NB 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.

Using the above generalised model and considerable experience drawn from many STP planners, operators and promoters[2] the key success factors for STPs that are now recognised as essential components in the planning and development of any new STP venture are:

- Setting out the strategy and objectives of the new park and deciding on the best model for implementation – STPs are involved with places, many complex processes, diverse relationships and they must be able to understand this agenda and manage it well
- Engagement of the knowledge base – an active, effective and multi-dimensional relationship with a university or other public sector research organisation is often seen as crucial – usually working best where the university sector also has a remit to transfer knowledge and technology to industry
- Interaction with the public sector at local/regional, national and European level – STPs are not stand-alone organisations, they are closely connected with the development of the innovation ecosystem
- Securing the land, capital and revenue to establish the STP and ensure its on-going growth is often a critical and time-consuming stage – STPs should not lose sight of the objective to create a working environment that stimulates innovation and knowledge-based business growth

[2] See Chapter 2 – under the heading STP Theory and reference 32

- Assessing the nature of the local skill base – STPs will need to address any weaknesses in entrepreneurship levels or technology-SME management skills
- Addressing the availability of regional and national markets or corporate supply chains – the weaker any of these markets are the greater and more imaginative the efforts of the STP management needed to be in order to increase demand through processes such as business incubation, SME growth programmes, new finance offerings for the development of technology-based businesses, etc.
- Selecting the package of services to deliver to tenant companies and businesses in the wider economy – STPs need to analyse the local innovation ecosystem to identify the weaknesses that they should seek to reduce by working with local partners or by creating added value professional services as well as property offerings
- Deciding on the appropriate science park model – most STPs stakeholders require that the STP achieves financial sustainability within a reasonable timescale. However, this can involve grants and subsidies to allow time for viability to be secured while pursuing the economic development goals
- Selecting a strong leadership based on a board / committee structure that has good connections into the local economy (private and public) and a CEO with appropriate sector experience and strong leadership and management skills.

Need and Potential of STPs

There is evidence that increasingly STPs see themselves and behave as actors within their local innovation ecosystem. This also accords with research findings and theory.

The 'need' and 'potential' for an STP are often defined in terms of the employment socio economic outputs they can generate. However, it is rare for the 'need' to be explicitly linked to the improvements an STP could bring to an innovation ecosystem and hence at the planning stage of a new STP, often too great an emphasis is given to the STP's land and property. A more appropriate approach would be to stress the identification of the combinations of property, services and partner working arrangements that are most likely to supply the 'need' for a more efficient and effective innovation ecosystem. In this context the property is a means to an end and not an end in itself. The 'potential' then becomes an assessment of the additional employment and other socio-economic outputs that the new facilities, services and working patterns can be expected to deliver.

Public Sector Support of STPs

In the period from 2000 – 2012 the central estimate sector of public capital investment into the EU's STPs is circa €4.8billion alongside private sector investment of €6.9 billion. In addition, revenue grants from the public sector in support of the professional business support and innovation services of these STPs totalled approximately €1.7 billion over the same period, again with a significant private sector input of about €1.3 billion.

These represent significant levels of public sector investment in STPs which shows little sign of abating in the short and medium term. It is therefore appropriate and natural to ask whether the investment represents good value for money, whether it is being applied to appropriate STP projects and how can public sector funders decide when and how much to invest.

There are two dimensions which complicate the answer to these questions:

- The stage of development of the STP – whether it is a new project, early stage development or mature project
- The nature of the innovation ecosystem that the STP will be working in – whether it is an advanced ecosystem such as might be found in an EU Innovation Scoreboard[3] 'Innovation Leader' region or weaker ecosystem as might be found in a 'Modest Innovator' region.

Contrary to expectation, the risk to public sector funders is usually modest at the STP formation stage provided that the concept for the new STP is developed around the known success factors and, most importantly, a comprehensive feasibility study is conducted before any substantial investment is committed. Such measures should ensure that initial investment is proportionate to the risks identified through the feasibility study (i.e. avoiding over-building) but large enough and of a nature to start mitigating critical weaknesses in the local innovation ecosystem.

In some cases, the next stage of development can be one of the most risky stages. At this point feasibility is no longer relevant and it will be far too soon to expect evaluation techniques to provide any guidance. This is also the time when often the STP will not be financially sustainable and its scale will be relatively small so that it will have little resilience should its economic environment become adverse (e.g. through recession or closure of a major local company).

At this stage, the factors that 3rd party public sector might consider before committing new capital would be:

- Confirmation that the STP is securing demand of an appropriate quality at a rate that justifies the proposal for further investment in buildings
- Confirmation that the STPs existing revenue projects are delivering the anticipated socio-economic outputs
- Evidence that the park is integrating well with other key players in the local innovation ecosystem
- Evidence that the STP is broadly on track to meet promoter determined breakeven targets as embodied in the current business plan
- Evidence that the management are performing well and have the confidence of their owners and governing body.

As an STP matures between years five and ten, it will start to accumulate a track record. This may be a time to moderate public sector investment in favour of private funding (particularly for capital expenditure) or if the track record is good and the private sector investment market has no appetite for STP investment, then this can be a signal for increased public sector investment. However, a thorough review would be a logical step before investment is committed. This would include:

- An evaluation of the outputs generated by the STP per € of public sector expenditure, i.e. value for money considerations
- Assessment of the improvements the STP has contributed to the innovation ecosystem, i.e. strategic considerations

[3] See Chapter 2 – Figure 2.3

- Assessing the effectiveness of the governance structure and management in establishing the key STP success features, i.e. efficiency and effectiveness considerations
- Analysing the finances and financial structure of the STP to determine its sustainability, i.e. financial considerations
- Undertaking comparative performance analyses with other STPs based in similar economic and innovation ecosystem environments, i.e. competitiveness considerations.

Older, mature STPs should have a track record including outputs and outcomes that make them amenable to full evaluation studies that can be used as a guide to 3rd party public sector funding decisions[4].

Improving STP performance

The techniques of feasibility studies, reviews and evaluations are all useful tools to provide an input to strategy and business plans and provide feed-back to the owners, governance boards and managers of STPs from which they can learn and improve their performance.

In most EU countries where STPs have been established for some years, national STP Associations have emerged. These bodies provide opportunities for STP managers and their senior staff to exchange ideas and learn from each other. The more well established national STP association also hold regular workshops, seminars and an annual conferences which provides the members with broadly based information, awareness and learning opportunities from specialists in the many fields that STP managers need to understand and manage, including: facilities management, marketing and letting, business start-up, SME business support and financing, technology transfer, open innovation etc. When well thought out and planned by the association such programmes come close to professional CPD programmes but without the formal testing.

In two Member States there are activities to establish a quality or accreditation mechanism for STPs but neither had a fully established and working scheme by late 2013. Both of these schemes could serve as models for other EU national STP associations, which if adopted more widely would provide standards that could give 3rd party public sector funders greater confidence as to the efficiency and effectiveness of the organisations that they are considering for funding. This field of STP quality and accreditation standards is an area of opportunity that both national and EU economic development funding bodies might seek to encourage.

The underperforming STP

Failure in STPs is sometimes perceived when in reality the park is facing 'hard to unlock' potential in a weak innovation ecosystem. In these cases more investment and not less may be the best strategy provided that management competence and good governance can be demonstrated. However, if an STP's finances are parlous and the recovery investment needed would be very high or if 'mission creep'[5] has led to the STP becoming indistinguishable from a business or office park, then a sale of

[4] Chapter 4 fully discusses the processes for conducting an STP evaluation exercise.

[5] The term 'mission creep' is sometimes used to describe the situation where STP management allow occupation of their premised by organisations that are not technology or knowledge-based or innovation-led in disproportionately large numbers or areas of space so that the occupier profile of the park starts to more closely resemble that of a business or office park than an STP.

the assets may be in the best interests of public sector investors. These investors can then recover some or all of their investment and re-cycle it into other economic development initiatives.

Managing public investment in an underperforming STP as opposed to failure involves the greatest level of complexity. Risk profiles as set out in chapter 6 can help to put these cases into perspective. A recognised accreditation or quality standard and/or an update of a recent review together with a board approved business plan may be valuable in giving confidence that the STP is performing sufficiently well to justify further investment or that investment should be withheld pending improvements in performance.

Private sector investment in STPs

Private sector investment in an STP carries risks as well as an opportunity to grow a park faster than may be possible by relying on public sector finance. Nevertheless, there are recognisable limits to private sector experience of STPs as an economic development tool, although a small number of private sector property investors and developers are becoming more aware of the opportunities. However there is also a growing understanding of the categories of STP buildings that allow the private sector to remains close to its comfort zone[6]. Recognising and adapting to these realities can lead to successful public – private investment on STPs.

In Conclusion

STPs have much they can offer in supporting economic development in a locality. They are one of the few parts of the innovation ecosystem that root into the local economy new innovation-led businesses and inward investors. By working with others they can also close certain types of weakness in the innovation ecosystem, improve the culture of entrepreneurship in knowledge based sectors and stimulate greater numbers of higher added value employment opportunities.

In many but not all cases, STP promoters need the help of public sector funds to achieve the above outcomes on a reasonable timescale. However, the public investment needs to be made in a way that maximises the economic gains while minimising the risks from supporting a project likely to underperform or fail. For the public sector to achieve this objective when investing in STPs means that such investors need to become well informed, understanding what STPs can and cannot do and the factors that influence their performance. This will not only allow a healthy dialogue between STP promoters and public funders but will ensure that any feasibility studies, reviews, evaluations other analyses or accreditations put forward by STPs in support of proposals for funding can be given appropriate weight in informing the judgement of those entrusted to make the public funding decisions.

[6] See Chapter 6, figures 6.1 and 6.2

Table of Contents

Introduction

This report is concerned with the performance, operation and funding of the 362 (or thereabout) Science and Technology Parks (STPs) in the EU and the nature and extent of the economic development outcomes they deliver. The report was commissioned to provide guidance and insight to inform the development of policy in respect of the further assistance that the European Commission through its many programmes might make available to STPs. Clearly this would require that there was a natural alignment between EC policy objectives and the work undertaken by STPs to secure desired outputs. In particular the report was required to highlight the role of ERDF and other parts of the structural funds programme in the development of the STPs in the ERDF eligible areas of the EU.

To deliver the requirements set out by the Commission previously untapped data sources were accessed. These included:

- A world survey of STPs undertaken by the International Association of Science Parks (IASP) in 2012. The European Division of IASP re-analysed this data set to include only EU STPs. This data set included between 60 and 70 STPs for each of the parameters measured.
- The IASP European Division 2013 data set with returns from 129 EU STPs that was made available to the author. The population of EU STPs at the time of this survey was estimated as 362 based on information provided by national STP associations and further desk research. For the parameters reported here, sample sizes carrying the relevant information were typically about 100 but ranged from a low of 61 to a high of 124. Further information on the nature and extent of the samples are provided in Annex 0.1. This latter data set was more detailed on matters related to the property investment and employment indicators of EU STPs and therefore highly relevant to the purpose of this report.

It also became clear during the writing of this guidance report that the EC's work on the Innovation Scoreboard was a natural context for examining the activities and performance of EU STPs.

A variety of research references, good practice documents and the expert advice and opinions of others with long standing experience in the field to add to that of the author were also drawn upon in the preparation of the report.

Structure of the Report

The structure of the report was predetermined by the Commission and only on a few occasions where strong logic dictated was material moved from the set chapter heading to another. The terms of reference are set out in Annex 0.2. In brief, the chapters were required to cover the following:

- Chapter 1. A statistical profile of the EU's STPs, the economic drivers behind their establishment and the economic development contributions made by STPs. The public sector expenditure involved in creating those contributions is identified with particular reference to ERDF support
- Chapter 2. The need and potential for a new STP. This chapter provides research, theory and evidence necessary to give a context for establishing need and potential

- Chapter 3. How to conceive a new STP, the sub sections of this chapter are aligned with the generally accepted success factors for STPs and how they relate to plans for its development
- Chapter 4. How to evaluate existing STPs. Evaluation methodologies appropriate for STPs are set out with the implications this has for data gathering
- Chapter 5. How to operate and improve the performance of an STP. Starting from management strategies the chapter explores ideas on finance, relations with the knowledge base, the built environment and growing tenant companies that are key to good operational practice. The role of the EU's STP Associations is examined for the ways in which they are currently working to raise standards and what more might be done.
- Chapter 6. Public sector Funding and the STP Lifecycle which is concerned with funding of STPs and in particular public sector funding as STPs move from start-up to maturity and risk reducing tactics for the public sector. Situations where ceasing public sector support is justified are discussed together with what is needed to recognise those situations.
- Chapter 7 Conclusions including the relevance of STPs to SMART specialisation strategies and other relevant EU programmes.

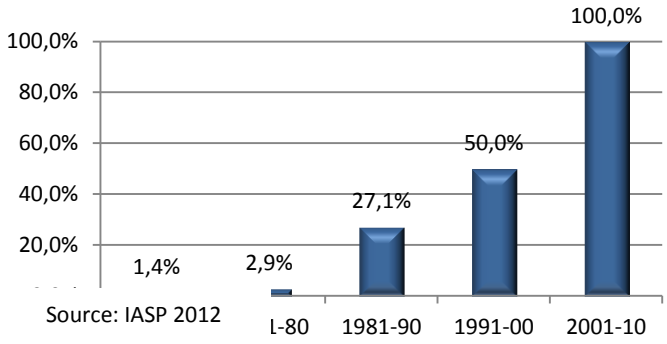
1 The Contribution of STPs to Regional Economic Development

This section of the report starts with a short statistical profile of EU STPs as a backdrop to an analysis of the contributions that an STP can contribute to regional economic growth. Working from the key strategic outcomes that STPs believe they have been set up to deliver, the analysis uses survey evidence to identify how STPs set about delivering those outcomes and the financial resources that they have secured to do so. The role of the public sector and in particular EC ERDF structural funds are analysed in detail.

Background

Europe was introduced to STPs in the decade from the mid-1960s to the mid-1970s. The numbers were very small indeed and largely confined to France and the UK. The development of these parks was generally slow. The real take off point for STPs in the EU occurred in the 1980s as shown in Figure 1.1.

Figure 1.1 The number of European STPs by decade as a percentage of the 2010 total



Source: IASP 2012

A steady growth in numbers continued through the 1990s but then in the period from 2000 -2010 STP numbers accelerated doubling the historical cumulative number that had been created up to the year 2000. Interestingly, even the growth of the earliest STPs accelerated once the movement as a whole started to become significant. There seem to have been a number of coinciding forces behind this growth in the number and the scale of STPs including:

- The rapid growth of the ICT sector, starting with a proliferation of small hardware companies using the new generations of microprocessors for a myriad of industrial and commercial applications. An explosion of software related activity accelerated the growth of the sector which was then sustained by internet and web technologies, mobile and wireless, computer games, digital media, etc. These companies needed high level skills and high quality quasi-office environments. STPs were a perfect solution with the right working environment and access to technically qualified graduate communities.
- A similar trend emerged from biotechnology and other life-science businesses. From the 1990s onwards, the venture capital markets steadily grew and extended from Western Europe to all other areas and they had an appetite to invest in life sciences. Although this investment tended to run in peaks and troughs the peaks creating considerable demand for new labs. Again STPs were a logical solution for the early stage and growth of these companies.

- The realisation by public policy makers that the businesses setting up and developing on STPs tended to create both more employment faster than other forms of industrial and commercial property development and the fact that the jobs were higher added value giving rise to faster wealth creation.

The STPs formed in the 1980s and 1990s were able to benefit from the above trends and generally grew fast as a consequence. However, at the turn of the century the 'dot-com' bubble burst, disillusion by venture capital and other investors set in and the above key driver technology sectors for STPs slowed markedly. Thus the new generation of STPs created in the decade 2000 - 2010 faced a more difficult market. The new parks established in a region that did not already have an STP could expect to tap into 'latent' demand, i.e. existing ICT and other technology companies that did not otherwise have access to the types of working environment and services that a good STP usually provides. However, once latent demand had been taken up then, in part, further STP growth relied on the STP stimulating demand through the provision of services designed to:

- Create new knowledge-based and innovation-led businesses
- Accelerate the growth of existing SME client businesses by assisting them to innovate more successfully or by helping them to better exploit their existing technology-based products and services
- Increase inward investment of knowledge-based businesses.

STPs are now increasingly seeing themselves as a part of an innovation ecosystem which they should work within to achieve goals for employment creation and financial sustainability. STPs need a strong innovation ecosystem to be effective and flourish. Consequently, many STPs have recognised that when certain areas of activity are not provided in sufficient depth by the local innovation ecosystem then they need to offer, or induce others to offer, the relevant services. If, these services are not provided then the formation and growth of their client knowledge-based businesses is inhibited. STPs are often able to secure public sector support for these additional services when they can make the case for a market failure.

While this background is necessarily succinct and passes over many detailed differences across EU Member States, it nevertheless sets a scene that many park management and owners will recognise.

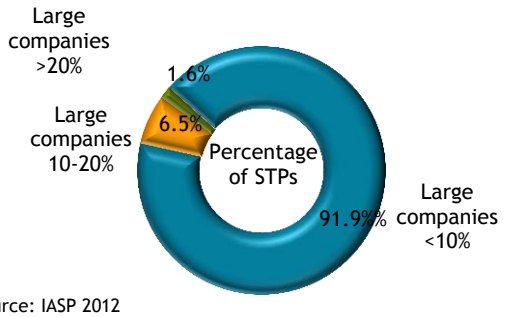
A Profile of EU STPs

The following profile is intended to highlight those features of EU STPs which are either almost universally true or are true in a clear majority of cases.

Nature of Occupiers

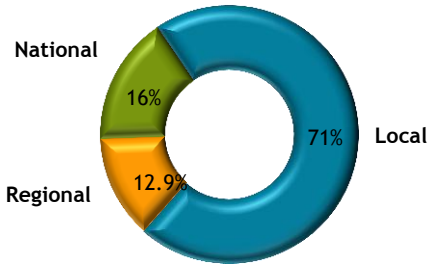
STP occupiers are dominated in number by SMEs and in many cases micro businesses. These businesses make up the largest single tranche of occupiers by number. Figure 1.2 shows that 92% of STPs have fewer than 10% of their occupiers who are non-SMEs. Of course, the number of employees employed by a few larger companies on an STP can quite easily be larger than the aggregate employment of all the SMEs. Nevertheless the much larger numbers of SME businesses necessarily means that STPs have property offerings and services that are highly relevant to the needs of the knowledge-based SME community.

Figure 1.2 Resident companies with more than 250 employees (non- SMEs)



Source: IASP 2012

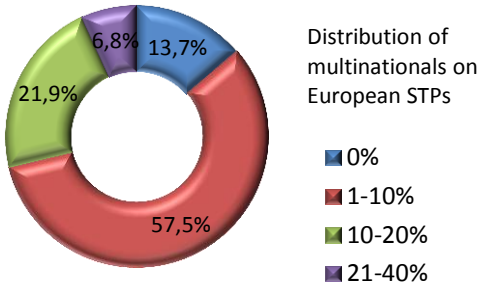
Figure 1.3 Origin of the majority (>60%) of resident companies in EU STPs



Source: IASP 2012

The second key feature of STP occupiers is that a clear majority come from the locality or region as shown in Figure 1.3. Thus 83% of STP occupiers have come from the locality or their region. This emphasises that STPs are above all else a local / regional phenomenon.

Figure 1.4 Percentage of multinational companies on EU STPs



Source: IASP 2012

When it comes to the presence of multinational company occupiers, IASP 2012 European Division statistics shows that on average they represent just 8% of occupiers. However, further analysis as shown in Figure 1.4, confirms that the multinational occupier market is heavily skewed in favour of a few STPs with about 20% of STPs securing more than 10% of their occupiers in this category. However, this is an important minority as they are likely to be those STPs that have achieved a high level of presence in their market and as a consequence are often larger and perceived as more successful. Pure locational factors can also play a critical role in determining the volume of multinationals attracted to an STP.

Relations with Universities

In the following chapters the significance of the knowledge base to the development of STPs will be explored. The key components of the knowledge base are universities, other higher education institutes, public research institutes and corporate research facilities. While any or all of these can have close working relationships with an STP, it is the university sector that is most frequently the closest working knowledge base partner or stakeholder.

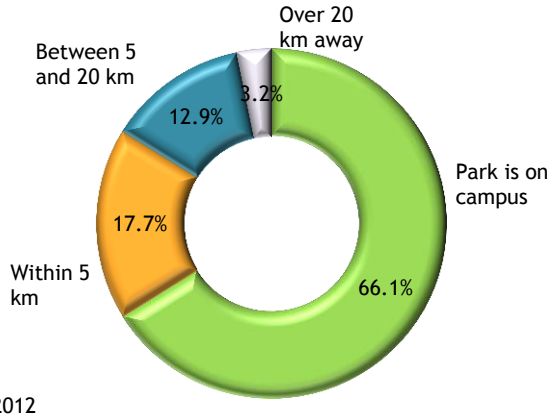
Table 1.1 shows that STPs see universities as either very important or moderately important to their operations and success in 95% of cases. Only government (local, regional or national) is rated as anywhere near as important (84%).

Table 1.1 EU STP Relationships with external organisations

	Not at all important	Slightly important	Moderately important	Very important
Universities/HEIs	1.6%	3.2%	**29%**	**66.1%**
Banks/other financial institutions	14.5%	33.9%	33.9%	17.7%
Venture/seed capital firms	12.9%	32.3%	29%	4.8%
Legal services firms	25.8%	40.3%	31.9%	8.4%
Government	6.5%	9.7%	25.8%	58.1%
Other (eg external investors)	12.9%	27.4%	45.2%	14.5%

Source: IASP 2012

Figure 1.5 Distance of EU STPs to their closest university

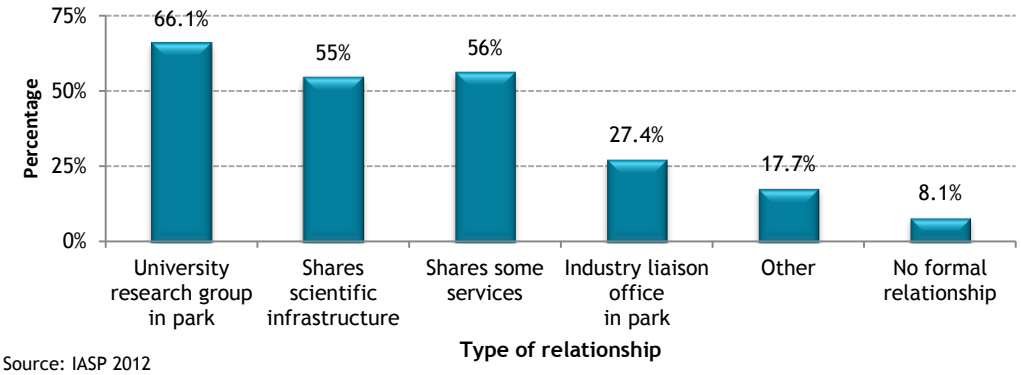


Source: IASP 2012

A close proximity to a university stakeholder or partner is generally believed to be helpful to establishing and maintaining a working relationship and Figure 1.5 shows that 84% of STPs are within 5km of their closest university and 66.1% are either on or adjacent to the university campus.

The nature of the working relationships between the STP and the local university are varied and multi-dimensional. Only the more formal aspects of these relationships are recorded by recent statistics and are depicted in Figure 1.6

Figure 1.6 Formal EU STP relationships with universities



Source: IASP 2012

On average, EU STPs have between 3 or 4 formal relationships with universities and the most frequently recorded forms of those relationships are hosting one or more university research groups in the park (66.1%), scientific infrastructures shared between the university and STP for the benefit of STP companies (55%) or other services being shared between the university and the STP. In only 8% of cases is there no formal relationship.

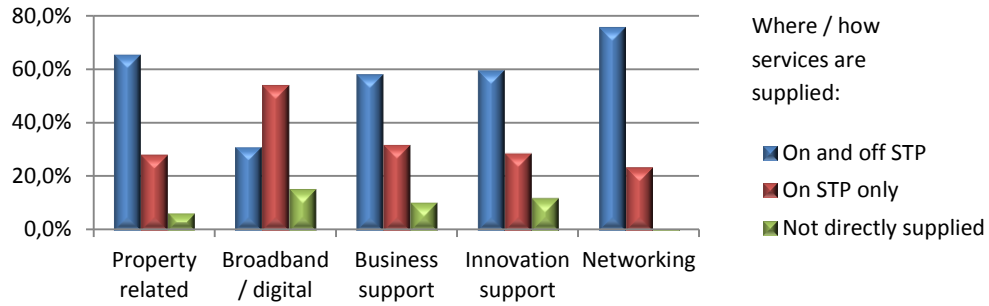
The provision of services

STPs can and do provide a wide range of services which are offered to ensure that the working environment operates efficiently and effectively for the clients in the park. Annex 1.1 provides a more detailed list showing the proportion of STPs in the EU that provide particular services. However, of more interest is the analysis of the broader categories of these services, as follows:

- Property linked (e.g. meeting room hire, secretarial services, café or broadband and digital telephony, social and recreational facilities)
- Business support services to assist SME start-up and grow (e.g. finance, marketing or training, etc.)
- Innovation services (e.g. R&D, technology transfer services, specialised high value scientific equipment)
- Networking services (e.g. bringing together business from both within the park and similar knowledge-based businesses elsewhere in the locality for specific events).

There is no doubt that the first of these categories, the property linked services, are important in the creation of an efficient working environment for a park's occupiers. Nevertheless, it is the other three categories of service that can add an important dimension to the way that STPs help to stimulate the formation, growth and development of their business clients. In Figure 1.7 below, the extent to which EU STPs provide these different categories of service is analysed. Where these services are provided directly by the STP, they can be either provided just to the park occupiers or to both park occupiers and to other knowledge-based businesses in the locality.

Figure 1.7 Key categories of STP services and where and how they are supplied



IASP 2013 survey

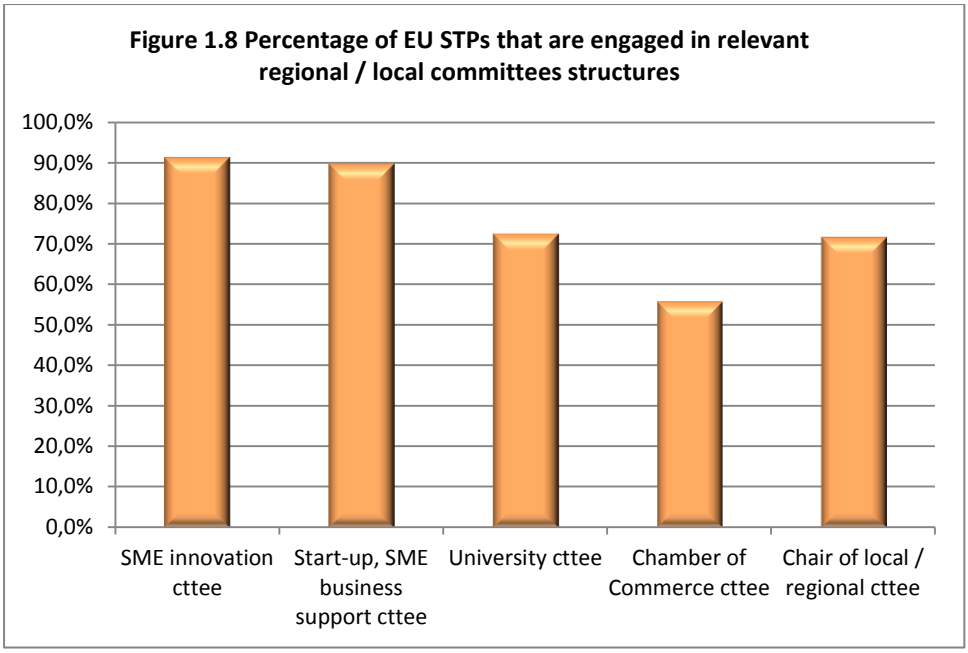
The important messages from Figure 1.7 is that a clear majority of EU STPs are extending their professional business support, innovation and networking services beyond their physical boundaries to other knowledge-based businesses in their region / locality. This is a highly significant finding from the 2013 survey work undertaken by IASP through its European Division. It is a clear indication that many STPs are playing a role in their local economic development and innovation ecosystem that goes well beyond the provision of property and property related services.

Integration of STPs with the knowledge base and economic development stakeholders

The picture of wider engagement of STPs with their regional knowledge base and economic development stakeholders is further reinforced by the evidence that members of the senior management team are actively engaged on relevant regional committee structures. These committees and working groups cover the following topics and institutions:

- Regional and local SME innovation programmes
- Start-up and SME business support
- Being on a University committee
- Being Chair of a relevant committee of local actors relevant to the work of the STP
- Being on a Chamber of Commerce committee

In the 2013 IASP survey of EU STPs there was no STP that was not engaged through at least one of these committee forms and in 68% of cases all of the first three committee types shown in Figure 1.8 were engaged by senior STP staff members.



Source: IASP 2013

The Contributions of EU STPs to Local Economic Development

This section of the chapter starts with the policy drivers for EU STPs as seen by their CEOs and senior managers and then presents statistical evidence on accumulated employment economic development contributions. Further evidence is presented that demonstrate the commitment of STPs to new knowledge-based businesses creation and support and technology cluster building.

Where outputs are quoted they are gross levels without taking into account any of the important modifying factors described later in chapter 4 on the evaluation of STPs.

In the final part of the chapter, the financial input invested in STPs to produce the economic development contributions is analysed.

Policy drivers for the creation of European STPs

In the recent survey of European STPs conducted by IASP European Division, senior STP management were asked to say what they thought were the major contributions that their park delivered to the local economy. There was a choice of nine possibilities as follows with each park ranking in order the top 5 most important contributions.

a. Employment creation
b. High quality employment creation
c. Technology transfer from knowledge base (university etc.) to businesses
d. Diversification of the industrial base of the local economy
e. Inward investment of technology companies
f. Creation of new technology businesses
g. Being a highly visible centre for technology and innovation in the local area
h. Having specialised property and facilities for technology businesses
i. An excellent working environment that attracts and holds high quality technical staff
j. Other

Table 1.2 below analyses the results. The dominant first choice was employment creation which accounted for 38% of all responses with 67% of these respondents stating that high quality employment creation was the main contribution to the local economy. Creation of new technology businesses was the leading second choice selection. The other contributions that were frequently cited were: being a highly visible centre for technology and innovation and technology transfer from the knowledge base to businesses.[7]

Table 1.2 Analysis of policy drivers for EU STPs

	Employment creation	High quality employment creation	Tech transfer to business	Diversifying the industrial base	Tech based inward investment	Creation of new tech businesses	Highly visible centre for innovation	Specialised property / facilities	Excellent working environment	Other	TOTAL
All European STPs											
1st choice	12.4%	25.5%	13.2%	4.7%	0.8%	15.4%	15.5%	4.7%	7.0%	0.8%	100%
2nd choice	4.7%	17.1%	17.1%	10.1%	3.9%	24.6%	10.1%	5.4%	5.4%	1.6%	100%
Northern European STPs											
1st choice	15.9%	27.3%	9.1%	2.3%	2.3%	15.9%	13.6%	4.5%	6.8%	2.3%	100%
2nd choice	6.8%	11.4%	13.6%	11.4%	6.8%	25.0%	13.6%	2.3%	6.8%	2.3%	100%
Southern European STPs											
1st choice	8.2%	23.0%	16.4%	8.2%	0.0%	16.3%	14.8%	3.3%	9.8%	0.0%	100%
2nd choice	1.6%	23.0%	14.8%	13.1%	1.6%	24.6%	6.6%	8.2%	4.9%	1.6%	100%
Eastern European STPs											
1st choice	16.7%	0.0%	33.3%	0.0%	0.0%	0.0%	33.3%	16.7%	0.0%	0.0%	100%
2nd choice	0.0%	0.0%	0.0%	0.0%	0.0%	49.9%	16.7%	16.7%	16.7%	0.0%	100%
Western European STPs											
1st choice	16.7%	38.8%	5.6%	0.0%	0.0%	16.7%	16.7%	5.5%	0.0%	0.0%	100%
2nd choice	11.1%	16.7%	38.8%	0.0%	5.6%	16.7%	11.1%	0.0%	0.0%	0.0%	100%

[7] Notes: (1) Sample total is 129 STPs, (2) North, South, East and West sample sizes are respectively: 44, 61, 6 and 18. (3) A few STPs nominated 'other' as a priority, but careful analysis shows that 80% of these could be adequately covered by one of the listed priorities. Most of the remainder wanted to specify a particular technology or industry sector specialisation as their priority. Source IASP 2013

When the economic contribution of STPs are separately analysed across the United Nations geographic definitions for North, South, East and West Europe some differences emerge:

- The priority of high quality job creation becomes more pronounced in Northern Europe
- While Southern Europe follows the general trend for the all-park analysis, a noticeably higher proportion of these STPs mentioned the 'provision of an excellent working environment' as first priority compared to the other European regions
- Notwithstanding the much smaller sample size of STPs from Eastern Europe it is nevertheless noticeable that for the first priority choices 'employment creation' came a distant second to 'Being a highly visible centre for technology and innovation' and ranked equal to 'having specialised property and facilities for technology businesses'. Creating new technology businesses was the dominant second priority as for the sample as a whole
- Western European STPs followed the general trend on first choice priorities but with an increased emphasis on high quality employment. However, at the second priority level 'technology transfer to businesses' displaced the creation of new technology businesses.

As these results relate to the actual perceived performance of European STPs, they provide valuable evidence that EU STPs can effectively support the following policy priorities:

- Employment creation and in particular high quality employment creation,
- The creation of new technology businesses and
- Technology transfer from the knowledge base to businesses

STPs are also able to offer high visibility to the technology and innovation agenda in their locality. More work with a larger sample of Eastern European STPs is needed to validate some significant differences in policy priorities that they appear to be targeted at fulfilling.

Employment and other outputs of EU STPs

It is clear from the above analysis of policy drivers that across most of Europe high value employment creation is their principal objective. In this section, survey results are used to estimate the gross employment levels of the EU's STPs and the increase in employment at these parks over the period from 2000 – 2012. This period has been chosen to coincide as closely as possible with two EU structural fund programme periods.

However, STPs are also concerned with ensuring that the jobs they create are substantially of a high added value. The evidence below suggests that STPs are proactive in the creation and development of new innovation-led businesses and stimulating the growth of other knowledge-based SMEs through both the deployment of their physical resources and from operating professional services.

Employment

EU STPs are estimated to have a total employment within their occupier organisations of between 700,000 and 800,000 employees based on the IASP 2013 survey described in the Introduction. The level of employment brought into STPs through the creation of new buildings during the period 2000 – 2012 is estimated at approximately 300,000 – 400,000 jobs across the entire population of

EU STPs. Within this latter total, the employment brought into those STPs that used ERDF to support their construction during 2000-2012 is estimated to be in the order of 120,000 – 160,000 jobs. Table 1.3 provides a more detailed breakdown of the estimated employment levels on EU STPs.

Table 1.3 Employment in EU STPs arising from investment in buildings[8]

	Low (000)	Central (000)	High (000)
Gross Employment Levels			
Estimated employment in ERDF eligible STPs	600	650	700
Estimated employment in non-ERDF eligible STPs	100	110	120
Total estimated STP employment	**700**	**760**	**820**
New jobs on STPs as a result of new construction over the period 2000-2012			
Estimated new jobs in ERDF eligible STPs	260	290	320
Estimated new jobs in non-ERDF eligible STPs	50	60	70
Total estimated new STP jobs	**310**	**350**	**390**
Estimated new jobs arising from new build directly supported by ERDF over the period 2000-2012	**120**	**140**	**160**

In addition to investment in buildings many STPs provide within their service portfolio services designed to support client innovation and the start-up and growth of innovation led SMEs. Table 1.4 provides a breakdown of the level of financial commitment EU STPs make to these types of interventions. The significant messages from this analysis are that in these important categories of professional services:

- 50% of EU STPs provide a level of service that was approximately equivalent to at least three fully supported people working full time. This includes the 37% of STPs that clearly have very extensive innovation and business support programmes down to others that have a level of services more consistent with just providing specialist support in a few chosen areas where they believe the local ecosystem needs strengthening.
- 41% of EU STPs provide a level of service that was approximately equivalent to less than a fully supported single person working full time. These STPs might be considered to be providing innovation and business support at somewhere between a basic level of service and a minimal service. In EU Innovation Leader regions this may be all that is needed. In

[8] Data courtesy of IASP European Division 2013 (ref 3)

chapter 2 there is deeper analysis of the need for STPs to provide professional services and the nature of the innovation support ecosystem of a region.

Table 1.4 Analysis of the level of resource applied to innovation and business services by EU STPs[9]

Total STP revenue expenditure over the period 2000-2012	Percentage of EU STPs in areas:		Total (%)
	ERDF accessible (%)	ERDF not accessible (%)	
0 - €1 million	42.4	33.3	40.9
>€1 million	57.6	66.7	59.1
>€3 million	46.7	66.7	50.0
>€6 million	33.7	55.6	37.3
>€10 million	16.3	38.9	20.0

Note: Revenue expenditure on professional services for innovation and knowledge-based business support only.

As shown in Figure 1.7, about 60% of STPs provided innovation and business support services at some level both to their tenants and external companies. Analysing the IASP 2013 data enables an estimate of the number of jobs that STPs might be contributing to the creation of jobs outside the park and also stimulating jobs within the park. Both numbers are shown in Table 1.5 below. Only the estimated employment created outside the STPs' premises add to the total employment given in Table 1.2. In the areas where STPs believed that ERDF was accessible this might have added 16% – 26% (45000 - 75000 jobs). The induced jobs within the park are effectively already counted within Table 1.2. However, it is plausible that without the professional services being provided by the park the 'building' related employment total may have been smaller by the levels for 'within STP companies' indicated in Table 1.5. For STPs in the ERDF accessible areas this may have accounted for about 15 – 25% of the Table 1.3 total central estimate of 290,000 jobs added to STPs during 2000 – 2012.

[9] Data courtesy of IASP European Division 2013 (ref 3)

Table 1.5 Analysis of the job creation supported or induced by STP revenue expenditure on innovation and business support professional services for the period 2000 – 2012[10]

Employment supported or induced:	Employment supported or induced in areas:		Total (000)s
	ERDF accessible (000)s	ERDF not accessible (000)s	
Within STP companies	45 – 75	25 – 40	70 – 115
Externally to the STP	40 – 70	10 - 20	50 -90

This analysis gives a clear indication that innovation and business support services operated by or through STPs make a valuable contribution to the stimulation of new high added value job creation.

Ensuring the Quality of the Employment at STPs

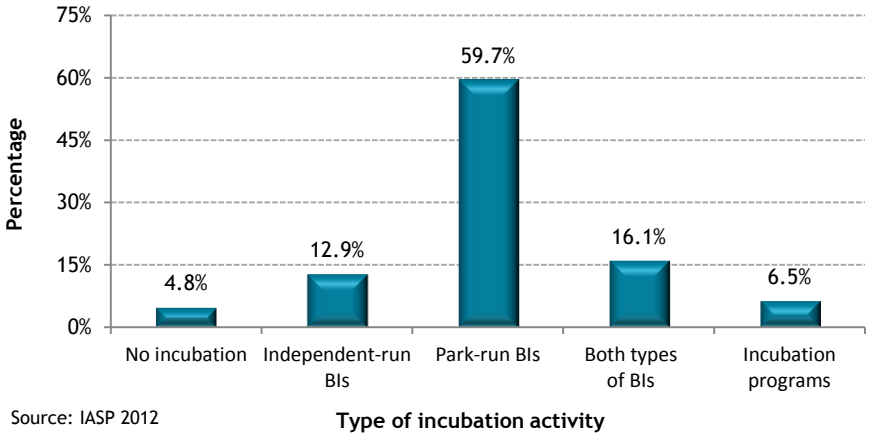
While employment outputs are undoubtedly the most important indicator of STP economic development contribution it is also very important that the employment being created is innovation-led or knowledge-based and offers prospects for high value job creation. In the following short section supporting statistical evidence is provided that indicates that STPs engage in practices, selection processes and client support activities that ensures that most of the employment at STPs is innovation-led / knowledge-based and furthermore helps to build clusters in specific technology fields.

Incubation activities at EU STPs – delivering new innovation-led businesses

As shown in Figure 1.9, approximately 82% of STPs operate one or more business incubators or an incubation programme while a further 13% host an independently operated incubator. These projects are designed to start and grow locally founded innovation-led businesses.

[10] ibid

Figure 1.9 EU STP Incubation activity

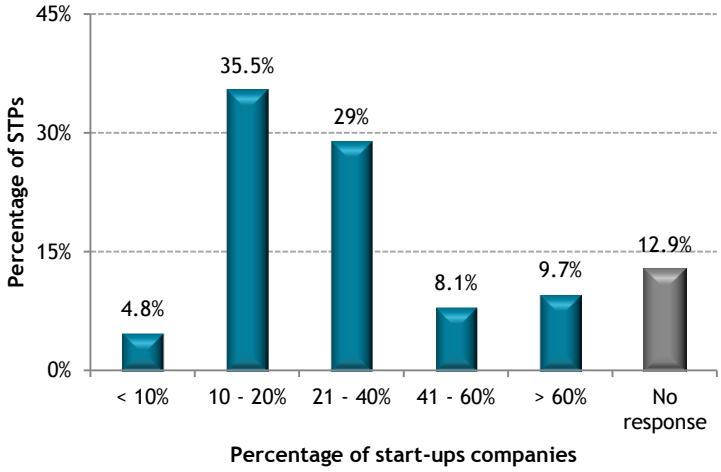


Source: IASP 2012

Supporting Start-up companies – creating new innovation-led businesses

Figure 1.10 shows that in fewer than 5% of EU STPs start-up businesses form less than 10% of their occupier base. While at 47% of STPs start-ups form over 20% of their client base. Since start-up businesses usually demand more STP management and support time than more established businesses this adds significantly to cost. However the benefits of a good incubation programme accrue to both the STP and stakeholders since the growth of successful new businesses leads to greater space take up (and hence rental income) as well as the desired economic development output of employment creation.

Figure 1.10 Start-up companies within EU STPs



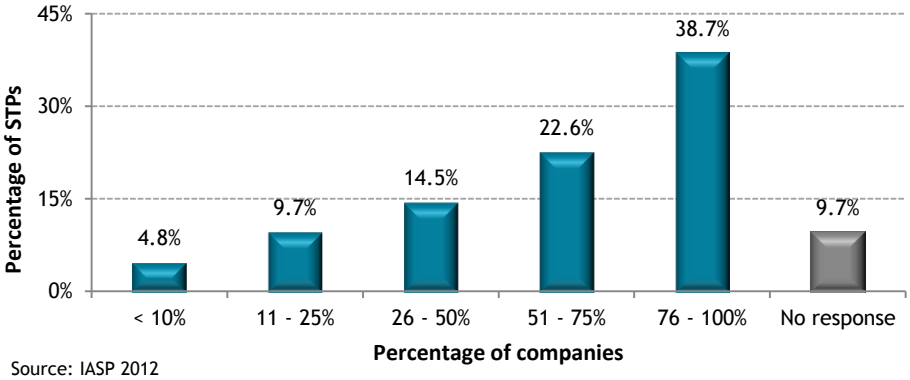
Source: IASP 2012

Technology ownership – selecting for innovation

Most firms located in STPs sell their own technology products and services, in other words, they create their own technology by being innovative rather than being resellers. Figure 1.11[11] shows that in about 76% of STPs 25% or more of STP occupiers are selling their own technology.

[11] IASP 2012 source information relates to (ref 2)

Figure 1.11 Resident companies in STPs that sell their own technologies



Source: IASP 2012

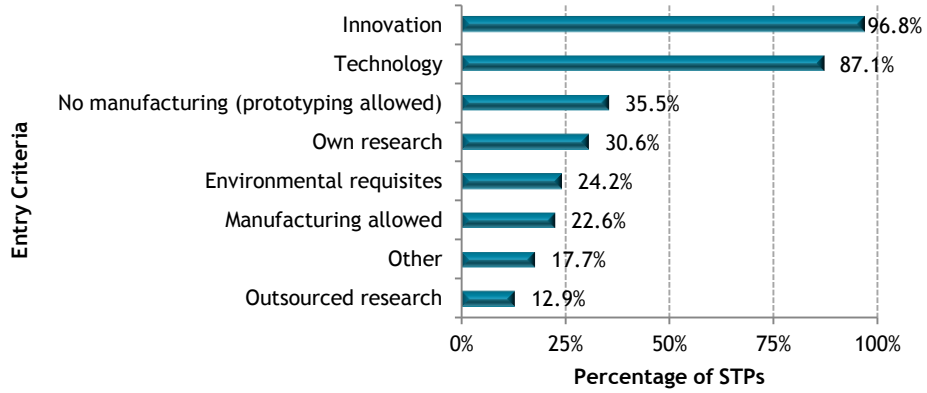
Innovation and business support – developing knowledge-based businesses

Figure 1.7 above demonstrates that professional innovation and business support services are provided at approximately 90% of EU STPs and furthermore at 60% of STPs these services are also supplied outside the STP premises to similar knowledge-based businesses. Table 1.3 takes the analysis further showing that the level at which these services start become significant occurs in about 50% of STPs.

Entry selection criteria for resident companies – selecting for innovation and technology

In Europe, innovation and technology are cited as the two most important entry criteria for selecting applicants for a residency at their STP

Figure 1.12 Entry criteria for residents in EU STPs

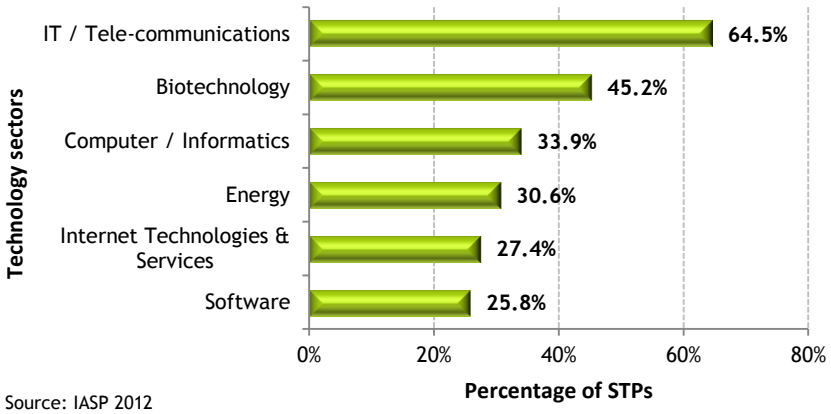


Source: IASP 2012

Cluster building through inward investment and the support of specific fields of technology

Figure 1.4 above shows that only 29% of European STPs have multinationals as more than 10% of their occupiers. However, when an STP does develop a sufficient presence and reputation that enables it to attract multinationals it becomes an important mechanism for securing inward investment to support the development of local and regional clusters. Figure 1.13 shows that there are some very clear technology areas that EU STPs have historically been good at attracting and developing. They cover many aspects of ICT, bio-med technologies and energy technologies. A longer list is provided at Annex 1.2.

Figure 1.13 Main technology sectors in STPs



Source: IASP 2012

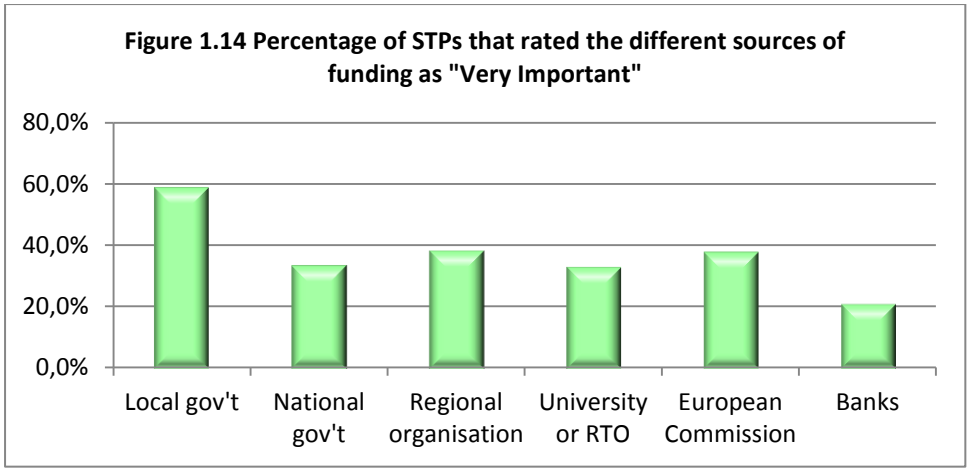
It is quite common for STPs to be seen as a focal point for clusters in a region or locality. This has interesting implications for the way that STPs are incorporated into SMART specialisation strategies for the purposes of targeting and focussing structural fund resources.

Resourcing of EU STPs

The relative importance of different funding organisations

Funding for EU STPs is one of the key obstacles to progress cited by many STPs whether at the start-up stage or later. Figure 1.14[12] shows the percentage of STPs that rated each of the principal public and private sources of finance as 'very important'. Local government is by far the most frequently rated as a 'very important' source of finance (59% of STPs) with regional economic development organisations and the European Commission structural or R&D funds each ranked 'very important' by 38% of STPs.

[12] Source IASP 2013 relates to ref 3



Source IASP 2013

The analysis of STP funding is separated into capital for the construction of buildings on STPs (excluding land acquisition) and revenue expenditure on professional innovation and business support services supplied or contracted for by the STP. General operational costs and the provision of other categories of services listed in Figure 1.7 above are excluded from the analysis.

Capital Expenditure analysis including ERDF

Table 1.6 below shows that across the EU during the period from 2000 to 2012, STPs invested in the order of €10 billion in building works. Of this amount about 40% came from the public sector. In those EU regions that where STPs believed structural funds were accessible to them public expenditure formed over 50% of STP capital expenditure. However, in the areas where STPs believed that structural funds were not accessible to them, public expenditure was much lower at approximately 20% of STP total capital expenditure, the balance being made up by private sector finance.

It is important to recognise that the above numbers are only averages. About 6% of STPs in ERDF accessible areas undertook the development of buildings entirely with private sector finance during the period 2000-2012. These were all medium-large or larger STPs adding modestly to their built environment - typically adding between 5 and 20% of total space. In the sample there were no new parks started in areas where STPs believed ERDF was accessible during 2000 - 2012 that were built purely with private sector finance. By contrast the new buildings of 27% of STPs that believed they could access ERDF funding for buildings during 2000-2012 were financed 100% by public sector finance. Of this 27% over half were STPs that started their first buildings during the period 2000-2012. Parks starting in this period were on average 63% smaller in terms of total built floor space by 2012 than the general STP population average.

Table 1.6 The estimated capital expenditure by EU STPs during the period 2000-2012 on new buildings or major building refurbishments or fit-outs[13]

	Estimated STP capital expenditure on new build and refurbishment			Analysis of capital funding by source of funding			Total
Locations where the expenditure is made	Low €M	Central €M	High €M	ERDF (%)	Other Public (%)	Private and own funds (%)	(%)
ERDF accessible							
All STPs in areas	6080	8040	9500	19	32	49	100
STPs securing ERDF	*4080*	*5630*	*6680*	*28*	*31*	*41*	*100*
ERDF not-accessible							
All STPs in areas	2160	3730	4170	n/a	20	80	100
Total	8240	11770	13670	13	28	59	100

Notes: (1) Generally land acquisition and major infrastructure has been excluded from capital expenditure (2) refurbishment implies substantial refurbishment or a major fit out programme (3) "STPs securing ERDF" includes the capital expenditure of STPs that believed they could both access ERDF and actually secured ERDF grants. About 30% of those STPs that believed they were in areas where ERDF was accessible to them and also undertook building construction from 2000 to 2012 either did not seek or secure ERDF funding to support this work. (4) The low central and high numbers are calculated as described in Annex 0.1 page 118.

The central estimate of total capital investment on buildings for those EU STPs that secured ERDF was €5630 million, of which approximately €1550 million was ERDF giving a 3.6 leverage ratio. Approximately 70% of all STP investment made in areas where STPs believed they could access ERDF was assisted by ERDF finance.

Revenue Expenditure including ERDF

The total central estimate of revenue expenditure by STPs on innovation and business support services over the period 2000-2012 is approximately €3 billion which equates to about €250 million per annum.

[13] Data courtesy of IASP European Division, (ref 3)

Table 1.7 Estimated revenue expenditure by EU STPs on professional innovation and business support services over the 2000 – 2012 period[14]

	Estimate of expenditure on innovation and business support services by STP				Analysis of estimates of revenue expenditure by source of funding			Total
ERDF / non ERDF location status and nature of companies supported:	Low €M	Central €M	High €M		ERDF (%)	Other public (%)	Private and own funds (%)	(%)
ERDF accessible								
Companies external to STP	880	1140	1500		23	40	37	100
Companies in the STP	790	1000	1330		26	40	34	100
Sub Total	1670	2140	2830					
ERDF not-accessible								
Companies external to STP	480	600	780		n/a	45	55	100
Companies in the STP	210	280	380		n/a	40	60	100
Sub Total	690	880	1160					
TOTAL	**2360**	**3020**	**3990**					

Notes: (1) ERDF in this table can also include other structural fund sources, CIP, Framework etc. (2) The low central and high numbers are calculated as described in Annex 0.1 page 118.

Table 1.7 separates the revenue as between the professional support to companies within STPs and the support to external businesses. A small sample of STPs from the 2013 survey provided sufficient data to compute the number of jobs secured or created for a stated investment in revenue expenditure. These averaged €20,000 per job which was then used to compute the figures in Table 1.5.

Conclusions

The EU STP movement has accelerated significantly over the last two ERDF programme periods and now provides employment for between 700,000 and 800,000 people.

[14] Data courtesy of IASP European Division, (ref 3)

EU STPs like many other STPs in the world are characterised by playing host to mainly SME companies that have emerged from the locality or region. The STPs that have gained scale and reputation tend to be those that also host multinational businesses in well above average numbers. Amongst their relationships with local actors, STPs rate universities as important to their success more often than other organisations, although local government is very important as a public sector funding source. However, it is the universities that STPs tend to be physically close to and with whom they have multiple levels of formal relationships - with both contributing different attributes to the local innovation ecosystem. EU STPs are developing an increasingly wide range of service offerings to complement the property solutions they can offer their clients. For many EU STPs some of their higher value added services are also supplied to similar knowledge-based businesses outside the walls of the park as a means by which they can further help the development of their local innovation ecosystem. This is particularly true for innovation and business support services for knowledge-based businesses. The senior management teams are active through many relevant committees in ensuring that their work is integrated with that of other actors.

The outputs generated by STPs are derived strongly from the policy drivers behind their creation with new employment, particularly high added value employment, being the most important policy driver across most member states. The activities which most STPs undertake that demonstrate their commitment to the drive for quality knowledge-based jobs are:

- The operation of incubation and start-up programmes for innovation-led knowledge-based businesses
- The operation of selective entry criteria that have resulted in EU STPs hosting mainly businesses in certain rapidly advancing areas of technology
- Providing innovation and business support services.

EU STPs have directly contributed to the employment of 300-400,000 people within their premises over the period from 2000 to 2012 and a further 50 – 90,000 outside their parks that are directly attributable to their professional services.

The investment inputs made over the same period to create these outputs have been:

- Capital expenditure of between €8-14 billion with 40% provided by the public sector
- Revenue expenditure of between €2.5–4 billion with 58% provided by the public sector.

2 How to identify the need and potential for a new STP

The early sections of this chapter are concerned with setting the background thinking for much of the rest of the report as well as being an essential precursor to answering the specific question of how founders, sponsors and stakeholders can best identify the need and potential for a new STP that they might be contemplating.

Starting from the definition of a STP the chapter moves on to describe some central elements of theory which underpin the science park movement. The fact that STPs are undoubtedly still evolving means that much that has been written about STPs ten or more years ago is of decreasing relevance making it complex to identify the most appropriate elements of theory to rely on. However, there are now increasing numbers of academic observers and STP practitioners who are finding common ground in their thinking and it is on theories where there is this meeting of minds that this report focuses.

As identified in chapter 1, the need to increase the volume of high value added employment opportunities through innovation and new technology is often the key driver for EU STPs and this in turn influences the services that European STPs offer. Not all STPs are successful and without success an STP's potential to fulfil policy objectives will be muted or insignificant so an examination of how an STPs services can influence a local innovation ecosystem precedes the identification of the 'need' and 'potential' for a new STP.

Both 'need' and 'potential' are examined from the perspective of the way in which an STP can contribute to an innovation ecosystem within a local or regional economy. 'Need' comes from the ways in which an STP can help to overcome existing weaknesses in the innovation ecosystem through its input of property offerings and appropriate services. While 'potential' is the output of actual employment opportunities and new and growing technology business that are the key policy drivers behind STPs.

Definition of an STP

There are numerous terms used to describe science parks, including: science and technology park (STP), technology park, research park, innovation park, technopole and innopole to name but a few. In addition, when there is substantial residential and urban development surrounding a park, then the initiatives are sometimes called 'city', techno-city or technopolis. Later in this chapter it will also be shown how the concepts of areas of innovation and smart cities that are currently emerging as mechanisms to promote innovation link to the science park movement.

The definition of "Science Park" currently adopted by the International Association of Science Parks and Areas of Innovation (IASP) is:

"Science Parks" are organizations managed by specialized 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; it 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."
(IASP International Board, 6 February 2002).

Individual national STP associations often create their own definitions. Annex 2.1 provides STP definitions from the following national STP Associations: APTE (Spain), SISP (Sweden), UKSPA (UK) and TEKEL (Finland). Across these national definitions and the IASP definition six different themes emerge as shown in the first column of Table 2.1 below. IASP, APTE, SISP and UKSPA all give varying degrees of weight to the first four of the six themes either directly or by reasonable inference from their definitions. The TEKEL definition is generic but seems to be weighted more towards inward investment and cluster development than the other definitions. Nevertheless even the TEKEL definition through the use of the concept of creating physical space and technology service operations aligns with the top two most common themes.

	IASP (International)	APTE (Spain)	SISP (Sweden)	TEKEL (Finland)	UKSPA (UK)
Promoting innovation and competitiveness of clients	yes	yes	yes	indirectly	yes
Local or regional economic development involving provision of space and other services	yes	Yes	indirectly	yes	indirectly
Working with the knowledge base	yes	yes	yes	no	yes
Tech start up activity /	yes	yes	indirectly	no	Yes
Inward investment of knowledge based businesses	indirectly	no	no	yes	no
Cluster developments	indirectly	yes	indirectly	yes	no

STP Theory

There are two well cited papers that bring further insight into the role of science parks. The first (Etzkowitz, 2000) sets out the concept of the "triple helix" involving the creative interplay between government, universities (and research institutes) and business. The paper describes how well conceived STPs are a valuable mechanism for catalysing the three parts of the helix to drive innovation. Subsequent authors have added 'the market/society' as a fourth strand to the helix (or Quadruple helix). This makes perfect sense since the desired output of the triple helix activity is new and innovative products and services which have to relate to the market and society in order to generate the jobs and wealth which are the primary objectives for establishing STPs. The second paper (Allen, 2006) defines eight criteria for creating a successful STP. All eight are relevant but four in particular are worth noting:

- A STP is not and cannot be a 'stand-alone' venture. It is intimately connected to and involved in the implementation of national and regional economic development policies.

- Connectivity and networking at all levels are essential to the STP and its tenants.
- STPs were originally considered mainly as physical locations housing scientific research activities. Then, at the turn of the century, location was considered by many to be less important and the focus turned to 'brains, not bricks.' The 21st century science park once again regards the built environment as vital, not as an end in itself, but as an aid to the process of creativity, interaction and innovation.
- An STP should see itself as a "gateway" to opportunity for its clients and not simply as a "destination".

These points confirm that the purpose of a science park is to play a role in innovation by working closely with relevant national bodies, assiduously building and operating networks and using their built environment to aid the processes of innovation.

In case it is thought that these ideas may be rather theoretical, it is worth bearing in mind the words of Dr Andrew Witty, CEO of GlaxoSmithKline (GSK plc.) who, at the opening address of the 2009 International Association of Science Parks conference, said:

"What GSK as an international company is looking for is a strongly pro-innovation environment where there is a significant talent pool all within a stable economy – given these features then GSK prefers to locate its key operations in a place like RTP (Research Triangle Park) that is driven by universities, local and regional governments and not in some nameless property developer driven Park."

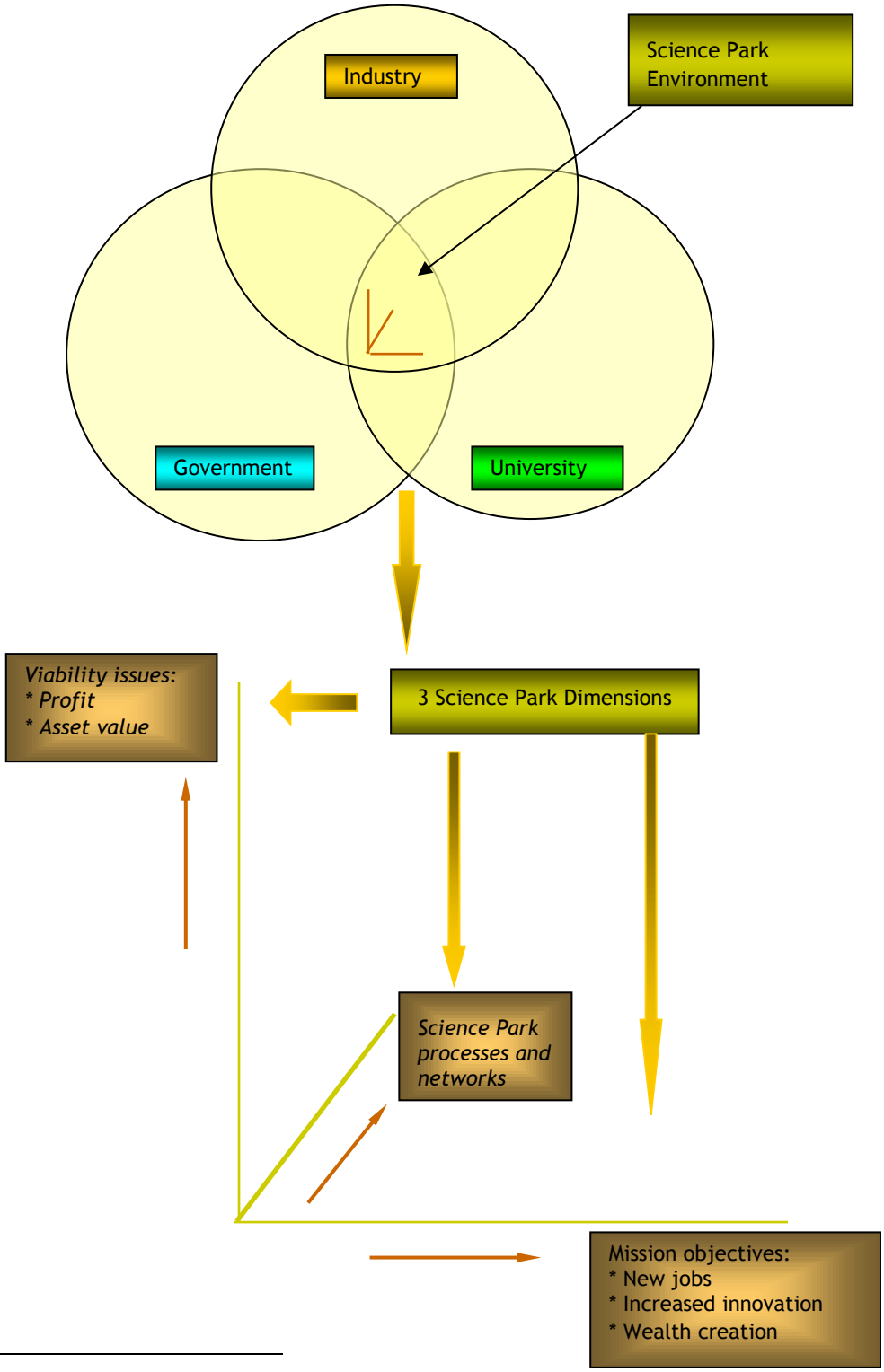
He went on to add:
"Building the right 'software' into a Park is where the true value lies."

GSK have an R&D facility on the North Carolina Research Triangle Park, which is the oldest science park in the world; they have also created their own innovation campus next to their corporate R&D labs in Stevenage to the north of London and they are about to embark on creating an R&D facility on the University of Nottingham Innovation Park (a relatively new STP). So there is consistency between action and words.

The above points are illustrated in Figure 2.1 starting from the triple helix concept which places a true science park as a proactive agent drawing on university (knowledge base) and government resources to deliver innovation through the business sector which in turn delivers economic development outcomes. The lower half of the diagram shows that the park itself then has to balance these public good economic development gains against a need to be sustainable over time. The third dimension of the science park is its networking and programmes (as described by Allen) which are the mechanisms it employs to deliver the economic development gains and at the same time are an important part of achieving sustainability by differentiating itself in the property market to attract and hold its client base. What good STPs are attempting to achieve through their networking and programmes is the development of a matrix of relationships among stakeholders such that the locality operates more like Silicon Valley *"where there is a continuous and high rate of*

transformation of knowledge and ideas into streams of innovations and the continuous formation of new companies exploiting those innovations".[15]

Figure 2.1 A Science Park's Environment and its Internal Dimensions[16]



[15] Monroe (2007) "Silicon Valley: the Ecology of Innovation" (ref 5)

[16] "Accelerating Client Growth – the strategic route to STP sustainability and regional economic Development", Rowe, IASP World Conference, Copenhagen 2011 (ref 6)

A well-conceived and implemented science park is therefore a powerful and sustainable economic development initiative that goes on producing its economic development outputs for many decades and should amply repay any public sector investment made in its early years.

The evolutionary development of STPs

STPs across the world have been evolving since the rapid growth of the movement started in the mid-1980s (Figure 1.1, chapter 1 refers). Table 2.1 below based on research by Fayolle shows how in both the US and in France there have been significant changes in the activities undertaken by STPs[17] since the movement first began in the 1950s in the USA and then in Europe through France in 1969.

Table 2.1: Evolution of the STP Model in the US and France (after Fayolle, 2011[18])

	USA		France	
	Types / Characteristics	**Growth**	**Types / Characteristics**	**Growth**
Pre-1990 Models	Stand-alone campus-like real estate parcels. Focus on existing business recruitment. Limited links with universities & research labs. Limited bus assistance or services. Lack of incubators/ innovation centres Mostly —technology garden models	Starting out with the Stanford Research Park in 1951 there were 20 parks in by 1979, and 127 parks by 1989 (largest growth in a decade).	Model in the form of "technopole" at an embryonic stage in search of an identity.	Starting out with the Sophia Antipolis Park in 1969 and Inovallée Park in 1972 there were 20 parks in by 1989
1990s Models	Anchored by R&D labs and universities. Focus on connectivity & networking Presence of incubators innovation centres Provision of support services for entrepreneurs "networked commercialization enablers"	By the end of 1999 there were 159 research parks	Anchored by R&D labs, industry and universities. Focus on connectivity & networking Boosting the local economy Mostly "Nursery garden models" Lack of incubators models	By the end of 1999 there were 41 parks
2000 & Beyond Models	Enhanced focus on support for entrepreneurial start-up & less emphasis on established business recruitment. Enhanced connectivity & networking (including global). Enhanced tenant amenities. Trend towards mixed use (commercial / residential) parks. "regional economic drivers"	179 total parks according to an AURP 2002 study,195 total park facilities estimated by AURP 2005, 174 university research park facilities according to Battelle 2007 study	Presence of public incubators Presence of seed capitals Enhance focus on support for entrepreneurial start-up and technological transfer Enhance focus on financial support with OSEO Development of collaborative projects	According to a RETIS 2010 study there are: 49 science parks, 28 public incubators, 36 European Centre of Enterprise and Innovation (CEEI), 8 clusters (centres de compétitivité)

[17] Fayolle, Lamine and Mian, (2011) Building Modern Regional Innovation Platforms: Evidence from the US and French STP Models, IASP Conference, Copenhagen (ref 7)
[18] ibid

The work of Allen[19], refined the approach to describing the changes that have been underway in the STP movement since the 1980s. He developed the concept of 'generations' of STPs and in particular defined the characteristics of a third generation science park embodying all the current thinking on what is that makes STPs effective and successful economic development projects in the context of a regional innovation ecosystem. The three different generations can be broadly characterised in the following way:

First Generation

STPs that started during and before the 1980s largely fit within the first generation whose key features include:

- A well landscaped site with good quality buildings
- An association with one or more Higher Education Institutions (HEIs). Most STPSs are linked to one university but some are linked to several
- Active links with the associated HEIs to foster technology transfer in support of innovation but only within the companies located in the park.

Second Generation

It was during the 1990s that many STPs began to realize that the smaller technology businesses they were supporting were not growing as fast as expected and that this was largely because the management teams of young technology start-ups were relatively inexperienced. Gradually, STPs began to expand the support they could offer these companies, providing access to finance, business start-up training, including mentoring and coaching programmes. In some cases these programmes were delivered by the parks themselves and in other cases the services were actively networked from outside into the park.

At the same time, STPs began to see themselves as an important vector in the innovation ecosystem of their region. On the basis of their experience of helping companies access their own HEI, these STPs start to take on the role of creating stronger and more complex networks to enable their client companies to access and secure the resources they needed.

Thus, a second generation STP can be characterised as having all the features of a good first generation park plus:

- Business support infrastructures for start-up and early stage technology businesses. Most frequently this takes the form of a technology business incubator together with mentoring services and a range of other support. Depending on what is, or is not available from elsewhere within the local infrastructure, the STP may also develop and provide other support measures such as: 'seed funds', business angel funding networks, start-up programmes, entrepreneur training, etc.
- Proactive networks to support innovation. These networks are created by the STP and are driven by the requirements of their clients. The networks therefore look out from the needs of the businesses towards the universities, research and technology organizations, and

[19] John Allen (2007), *Third Generation Science Parks,* Manchester Science Parks, Manchester, UK (ref 8)

technology supplier businesses. The networks are often given a focus through a programme of workshops or seminars that bring people together around a particular interest. However, the real power of the network lies in its ability to address and resolve particular technological issues for individual businesses.

Most well managed science parks created in the first generation era have evolved to become second generation parks.

Third Generation

The third generation of technology parks was defined in 2006 when some 30 of the world's leading park directors, developers, academic researchers and consultants gathered for a workshop in Manchester. Their findings were written up by Professor John Allen and later published. In summary it was concluded that the third generation will have all the features of a good second generation science park, but parks would be physically constructed to create spaces and environments that are conducive to high levels of creativity and innovation both informal and formally organised. These 'collaboration spaces' are made available to the occupiers of the STP but also draw in other companies and suppliers of services to create a rich mix of organisations and people that come together to improve the productivity of the highly complex processes involved in taking knowledge, turning it into a product or service and bringing it to market.

Annex 2.2 briefly describes the history and current activities of three well known, world-class STPs: Research Triangle Park (RTP) in North Carolina (USA), Sophia Antipolis (France), and the St John's Innovation Centre (UK). All have been highly proactive in stimulating their local and regional economy by becoming a substantive node or player in their regional business innovation ecosystem. The principal shortcoming that these three parks exhibit is that as older STPs their site layout and buildings were not designed from the outset to have complex collaborations in mind promoting informal as well as formal interactions. Nevertheless they do contain forms of collaboration space which is the key feature of a third generation STP.

Areas of Innovation

An emerging evolutionary development in the STP world is the concept of 'areas of innovation'. The origins of this idea seem to have grown from the Technopole concept developed in France. However in the 'areas of innovation' an STP is extended to relate to districts within cities, cities themselves or wider metropolitan areas. At the heart of the 'areas of innovation' STP model there is a network of STPs, Business Innovation Centres (BICs), business focussed university institutes and other innovation players, who come together to pool their offers into a focused model and make it available over an extended geographical area.

The earliest known example in Europe is Medicon Valley which brings together the Greater Copenhagen and the Skane region of Southern Sweden. These areas are linked together through the Oresund Bridge. The Medicon Valley Alliance was established to promote the area and its resources and to integrate all the players relevant to supporting increased business activity in the life sciences. The initiators for Medicon Valley were the universities in Lund and Copenhagen, strongly supported by the major pharmaceutical companies in the region; Novo Nordisk, Lundbeck and Astra-Zeneca. Today the Alliance membership extends to about 300 organisations, including: relevant university faculties, the regional authorities (who administer the hospitals), local government, biotech, pharmaceutical, and medical technology companies, contract research organisations, science parks,

investors and relevant business service providers. Seven STPs are included within the Alliance. Medicon Valley is recognised as one of the strongest locations for life sciences companies in Europe.

While Medicon Valley works by bringing together existing facilities and resources, a more recent development 22@Barcelona is creating a new environment with innovation support at its core. 22@Barcelona (www.22barcelona.com) is transforming an area of 200 hectares of industrial land into an innovation district for the 'strategic concentration of knowledge-based activities'. The project includes entrepreneurship support through the Barcelona Activa incubators and the development of Urban Clusters for ICT, MedTEch, Energy, Design and Media. In total there are over 1700 companies located in the area. There are new business facing institutes and centres in the fields of media, digital technologies and energy being built to assist companies in the development of market applications. An 'Urban Lab' project (a form of open innovation) has been established and is demonstrating the application of technology to urban issues in areas such as city centre traffic and parking management, noise pollution, waste management and new forms of street lighting. The city government acts as sponsors to these projects providing feedback so that the technology developers can trial and improve their technologies before launching them into a wider market.

In general these designated areas of innovation attempt to create an environment where all the facets of new technology product and service innovation from idea conception through R&D to demonstration and early commercialisation are established within the area and are linked together through operational networks of professionals involving social media, knowledge gatekeepers, forums etc. The establishment of such districts can involve:

- Creating or importing universities and business-facing research and development institutes (the latter often associated with or linked to the universities through which much of the collaboration spaces are created);
- Establishing programmes to attract talent, major corporations and sources of finance to support innovation;
- The establishment of the different types of facility (labs, incubators, offices, workshops, specialised equipment for use by multiple organisations and other collaboration spaces etc.) as well as;
- Creating an excellent environment in which to live.

Some of the names currently being used to describe these types of project include: Smart Cities, Intelligent Cities, Urban Labs, Living Labs as well as Areas of Innovation. The thinking behind the creation of these urban "areas of innovation" comes from the works and ideas of Richard Florida[20], Edward Glaeser[21] and Anthony Townsend[22].

STPs and 'Open innovation'

The concept of "Open Innovation" put forward by Chesbrough[23] with its emphasis on the use of external as well as internal resources for innovation is now assuming an increasing relevance in the innovation strategies of businesses large and small. It is also a growing theme in the innovation

[20] Florida (2003) "Cities and the Creative Class" , City and Community 2:1 March 2003 (ref 9)
[21] Glaeser, Triumph of the City, Penguin Press, 2011 (ref 10)
[22] Townsend, Smart Cities – big data, civic hackers and the quest for a new utopia (ref 11)
[23] H Chesbrough (2005) "Open Innovation – A new paradigm for Understanding Industrial Innovation"(ref 12)

services provided by STPs, suggesting another evolutionary development that may be underway as part of 3rd generation activity.

A 2012 EU EURIS project[24] report defined five policy areas that can best shape regional innovation ecosystems for the development of "open innovation" practices. Of these, three lie at the heart of good STP practice. They are:

- Networking and collaboration with well-structured processes and networks to find and to connect suitable partners for innovation.
- Human capital and an entrepreneurship culture with high level skills in the fields of innovation and knowledge management, cooperation management across different cultures and sectors, financial and networking skills along the entire innovation value chain.
- Access to Finance by supporting the availability of risk capital and raising the awareness of SMEs.

Encouragingly all four EU STPs involved in the EURIS best practice work were cited as exemplars in the Networking and Collaboration aspects of open innovation – a natural strength of STP as will become evident later in this chapter. There is also evidence that other STPs are developing and deploying novel open innovation practices with SME clients[25] including through Living Lab and Smart City projects which were described above under the heading "areas of innovation".

STP performance, their regional economy and the local knowledge base

There are many good STPs across the world including Europe. However, there are also failed STP projects. In the USA it is estimated[26] that just 25% of STPs achieved their goal of attracting and fostering R&D activity and contributing to job creation and economic growth. A second 25% became pure property developments contributing little to socio-economic change and 50% failed. There is no similar analysis for Europe but the ability to learn from some of the mistakes made in North America and the lower risk taking cultures prevalent across much of Europe seem to have resulted in fewer failures. Nevertheless there is undoubtedly a case for a closer examination of failed STPs in Europe as an aid to policy making and to guide the development of new and younger European STPs.

In order to appreciate the potential capability of STPs to deliver socio-economic benefits, there first has to be a model of the way in which STPs operate within an economy. A number of STP case study analyses in Europe and the USA conducted by academic observers have set the broad performance of STPs against the local economic and research environment to provide some useful indicators as to how a local economy influences STP performance. In a study covering STPs in the USA, Canada and Mexico, four different regional economy categories were defined and the success of STPs assessed through case studies[27]. The host regions for the STPs were classified into:

[24] Embracing Open Innovation in Europe - a Best Practice Guide 2012 www.euris-programme.eu (ref 13)
[25] Rowe (2013) Creating Clustering Behavior and Open Innovation in new Technology Industry Sectors through "Mini-Clusters", IASP World Conference, Recife, October 2013 (ref 14)
[26] Luger and Goldstein (1991), pp.74, 75. (ref 15)
[27] Leonel Corona, Jerome Detriaux and Sarfraz Mian (2007) Building Mechanisms for Nurturing Innovative SMEs: Lessons from North American Science Parks and Incubators (ref 16)

- **Regions with well diversified economy, a broad and established industrial base and rich sources of knowledge and research activity**. All the case study STPs were deemed to be successful adding to the innovation ecosystem.
- **Regions with relatively diversified economy, a focused industrial base and solid research capacity**. Two of the STPs in this category of region became good assets for the development of high technology business. A third specialist STP went through an extended troubled period. The final STP failed through bankruptcy.
- **Isolated regions with a limited industrial base and solid research capacity**. Each of these case study STPs grew a successful innovation pole but their isolation from risk finance which they had been unable to overcome held back the development of their high tech firms.
- **Regions with a small research base**. The case study STPs in this category were in Mexico and were assessed as unsuccessful.

The authors concluded that:

- STPs can contribute very significantly to the transformation and growth of a region into a successful knowledge pole, but they are not sufficient to bring about this change alone or unaided.
- The STPs work by providing an enabling milieu leveraging regional resources to successfully nurture technology based companies. They contribute to the critical mass of services and other support mechanisms offered in the region, facilitate networking and exchanges between the local research university, researchers, engineers and entrepreneurs and are therefore an important asset in local development.
- Key to STP success is the provision of a non-monetary value proposition related to R&D (proximity to a university or large research laboratories, presence of large anchor organizations or other local concentration of R&D activities) and to the availability of business services that enhance the development prospects of client companies.

A study of UK STPs conducted in 2003 by Angle Technology[28] compared the performance of parks and their client companies according to the state of the knowledge economy in each park's locality/region. As in the case of the Corona, research different knowledge economy states were identified and linked to the performance of STPs. The highest levels of knowledge economy again predicted for high performing STPs that exhibited third generation attributes. Again, as in the N. American study, STPs also performed well where there were more difficult local economic parameters provided that the knowledge base was generally good and local partners worked together effectively.

Public investment in STPs and the local economy and innovation ecosystem

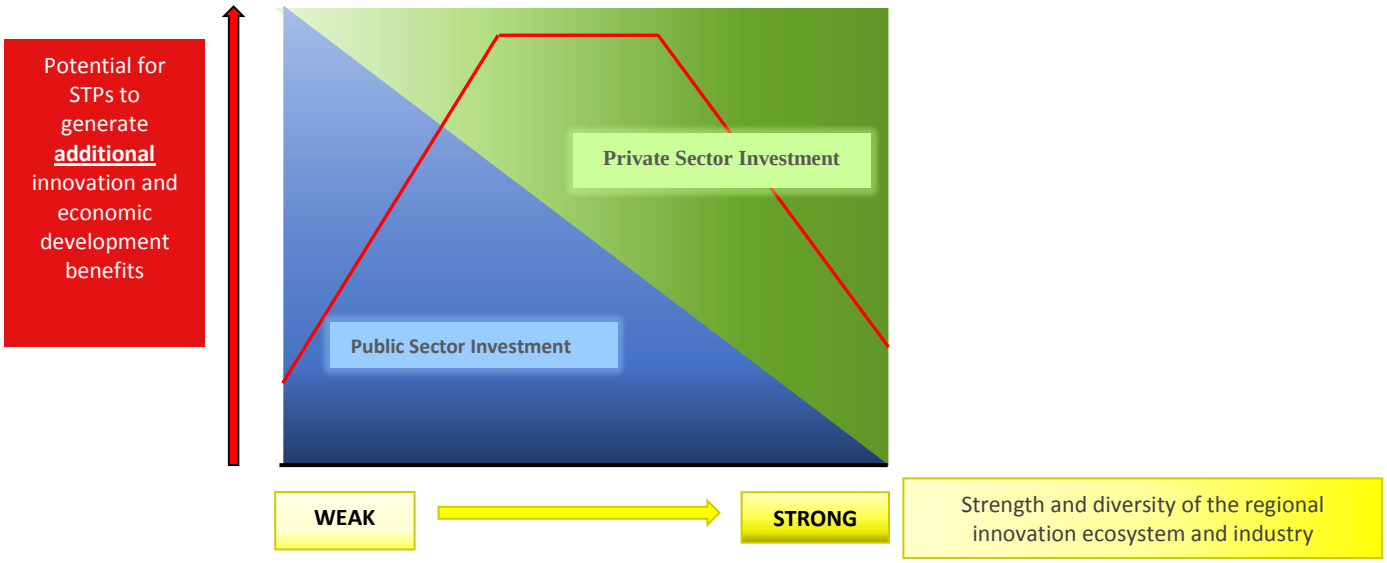
From the above evidence it is clear that the diversity and strength of a local economy and its innovation capacity have a strong influence on the performance of parks. What defines the level of

[28] Angle Technology (2003) "Evaluation of the past and future economic contribution of the UK science park movement" (ref 17)

public sector investment in a science park is the extent of the public good that the STP project is expected to create in the economy. Figure 6.5 illustrates the above point by identifying the polar extremes of the dimensions that define where little public sector intervention is needed and those where more significant public investment is required. In a situation where an economy has a large and diversified private business sector, good access for business to all forms of working capital and investment finance and powerful and effective institutions supporting business innovation, then investment in a science park can be left entirely to the private sector or at most there will be only minimal financial assistance required from the public sector. This might, for example, take the form of serviced land. Such favourable conditions as these only exist in a few places around the world and reach their pinnacle in Silicon Valley (California, USA) and the Boston area of Massachusetts. In terms of the EU classification used by the Regional Innovation Scoreboard[29] it would be those regions of Europe classed at the upper end of the High Innovation Leaders category (see Figure 2.3 below) that would approach this end of the polar spectrum Hovedstaden (Denmark), Karlsruhe (Germany) the Berks, Bucks and Oxford area (UK).

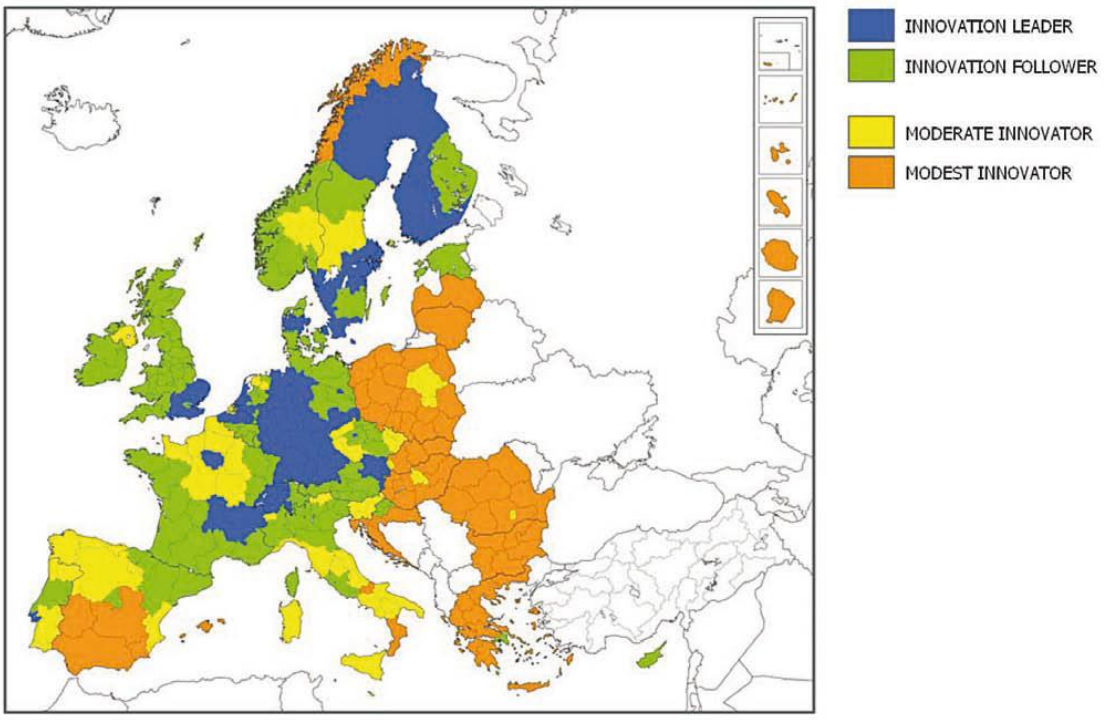
The other polar extreme would be exemplified by a weak private sector that is not well diversified, access to finance of all types is poor, institutions for supporting business innovation are absent or weak and there are limited private sector commercial property markets. Under these conditions any science park would have to secure considerable public sector finance so that the park becomes the organisation that provides those important missing components of the local economic infrastructure necessary to establish a healthy technology-based business community. Public sector sponsors would need to finance all or most property investments. Again, using the EU Regional Innovation Scoreboard terminology this polar extreme would relate to the low end of the Low category of Modest Innovators eg Nord-East region (Romania) and Swietokrzyskie (Poland).

Figure 2.2 STP Impact, the Innovation Environment and Public Sector Investment



[29] Regional Innovation Scoreboard 2012, http://ec.europa.eu/enterprise/policies/innovation/files/ris-2012_en.pdf (ref 18)

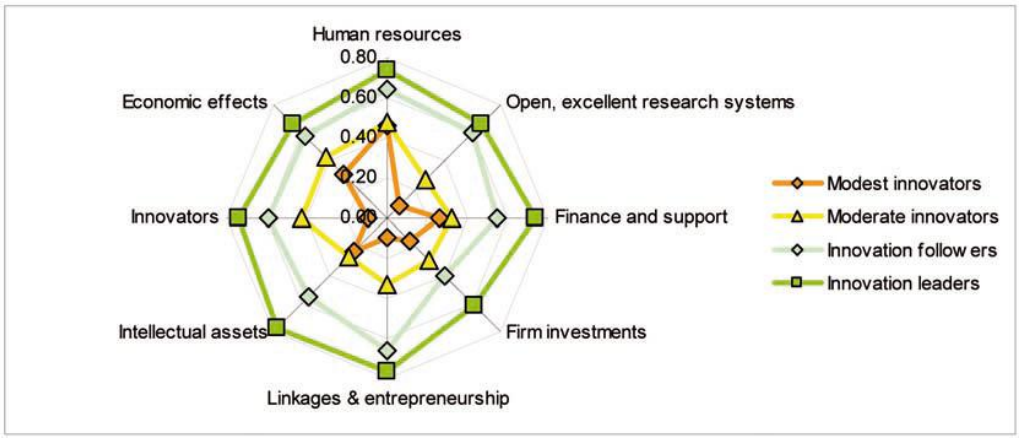
Figure 2.3 The EU Innovation Scoreboard Map



This analysis of regional innovation capability and capacity can be taken a stage further by examining the components that make up the rankings of European regions on the Innovation scoreboard and identifying those that relate to the types of services that many European STPs are known to supply.

Figure 2.4 shows the eight dimensions that make up the innovation scoreboard values and the high level of variability they have across the different categories of innovating regions.

Figure 2.4 Regional Innovation Scoreboard Performance Dimensions



In Table 2.2 below the features and measures that contribute to each of the innovation dimensions are described in outline and set alongside the organisations that are the relevant usual lead providers or stimulators of those features. The final column indicates the roles that European STPs can and do play in providing programmes and services that also contribute to improved innovation scoreboard measures.

Table 2.2 How STPs can improve a regions innovation scoreboard performance

Dimensions of the Innovation Scoreboard	Features and measures	Principal providers / generators of outputs	An STP as a provider / generator of outputs
Human Resources	Educational attainment measures	Universities and colleges	-
Open Excellent Research Systems	Academic paper citations and doctoral students	Universities and public sector RTOs	-
Finance and support	Public R&D expenditure and venture capital (VC) investment	Government and regional development agencies. VC firms and public sector VC funds.	Some STPs operate 'seed' funds and grant schemes to stimulate early stage risk innovations that can lead to VC funding opportunities
Firm investments	Business R&D and Innovation expenditure	Businesses	STPs often help innovation intensive clients to secure the resources to support innovation and some help to guide and shape SME innovation
Linkages and entrepreneurship	In-house SME innovation and innovative SME collaborations	SMEs	Some STPs operate open-innovation SME programmes, stimulate applications for EU collaborative R&D projects or secure student or recent graduate internships for SMEs to support innovation
Intellectual assets	PCT patent applications and Community trademarks and designs	Patent agents and IP consultants	Some STPs have in-house IP expertise to assist SMEs with knowledge management and protection
Innovators	SMEs Introducing product, process, market or organisational innovations and the number of high growth innovative firms	SME management teams	Many STP operate business incubation programmes to increase the number of high growth innovative firms. They also operate programmes to assist SMEs to identify, finance and deliver new products or services to market
Economic effects	Employment in knowledge intensive activities, technology product and knowledge intensive service exports, new to market / firm product sales		**The key output of STPs is new employment in knowledge intensive activities** Some STPs also actively assist their clients to export and sell their goods and services

Enterprise and entrepreneurship as a driver of innovation

The innovation performance of a region as measured by the EU Regional Innovation Scoreboard is closely correlated to its Regional Competitiveness index. Thus the case study research finding that suggests that a strong and diverse economy is helpful to the success of STPs is not at all surprising since the two tend to move together. However, one of the key features of an STP is its ability to

stimulate and develop new enterprise in the knowledge based sectors. This is important because many disruptive technologies emerge through new enterprises. The creation of knowledge based enterprises depends on two critical resources: a good supply of people with high level skills (which is measured by the innovation scoreboard) and a culture of entrepreneurship which is not included in the scoreboard. Therefore, no discussion of the important features of a local economy that influence the performance of an STP would be complete without acknowledging the significance of its local enterprise culture. The most frequently cited statistics are new business formation and cessation rates which are included in Eurostat down to NUTS 2 levels.

Table 2.3: Entrepreneurial Activity in Selected EU Member Countries

	Nascent entrepreneurship rate (% of adult population)	New business ownership rate (% of adult population)	Necessity-driven entrepreneurship (% of TEA)	Improvement-driven opportunity entrepreneurship (% of TEA)
Efficiency driven economies (WEF definition)				
Hungary	4.8	1.6	31.0	29.2
Latvia	6.8	5.3	25.9	46.2
Lithuania	6.4	5.0	28.4	47.2
Poland	6.0	3.1	47.6	31.5
Slovakia	9.2	5.3	27.6	33.9
Average	*8.4*	*5.9*	*28.2*	*41.7*
Innovation driven economies (WEF definition)				
Belgium	2.7	3.0	10.4	72.4
Czech Republic	5.1	2.7	27.3	56.5
Denmark	3.1	1.6	7.1	64.0
Finland	3.0	3.3	18.3	59.4
France	4.1	1.7	14.8	70.7
Germany	3.4	2.4	18.6	54.9
Greece	4.4	3.7	25.4	36.8
Ireland	4.3	3.1	29.5	36.9
Netherlands	4.3	4.1	9.1	62.3
Portugal	4.6	3.0	17.8	58.1
Slovenia	1.9	1.7	12.1	51.2
Spain	3.3	2.5	25.9	39.3
Sweden	3.5	2.3	6.1	67.6
UK	4.7	2.6	17.2	46.3
Average	*4.0*	*3.0*	*17.6*	*57.0*

Notes: (1) "TEA" is total entrepreneurial activity which is made up from the factors shown in the first two columns of the table each of which measure the percentage of the adult population (18 – 64) engaged in the relevant factor. (2) The final two columns show numbers for necessity driven and improvement driven entrepreneurship as a percentage of TEA.

More interesting are the annual GEM[30] (Global Entrepreneurship Monitor) statistics which are generally prepared at a national level but some countries choose to have them measured down to regional level. This data set also looks at the reasons why entrepreneurs form companies and broader measures of interest in the understanding of entrepreneurship in an economy. Table 2.3 taken from the GEM 2011 results divides nations into factor driven, efficiency driven and innovation driven economies. This is a far coarser division of innovation potential than the EU regional innovation scoreboard but again recognises the significant differences in enterprise are often related to the state of an economy. Table 2.3 shows that opportunity driven enterprise is significantly stronger in the innovation driven economies of Europe compared to most efficiency driven economies whereas the opposite is generally true for necessity driven enterprise. It is generally recognised that nearly all innovation driven enterprise is opportunity and not necessity driven. In a culture where the opposite is true it is far harder to encourage individuals to consider seemingly more risky business ideas thereby making the task of an STP considerably more complex.

Identifying the need and potential for a new STP

Using the ideas and facts presented in the sections above on "Theory" (this chapter) the "Policy drivers for STPs" (chapter 1, Table 1.2) and "European STP service provision" (chapter 1, Figure 1.7) the identification of the 'need' and 'potential' for an STP can be developed. However, first, the link between the services provided by STPs and the innovation ecosystem needs to be established. Table 2.4 below provides this link through a framework that identifies the dimensions of the innovation ecosystem and the actors that more usually deliver the services that make up those dimensions. The table shows that STPs provide valuable services within many of the dimensions listed but the extent to which there is a 'need' for it to do so depends on the absence, or more usually the relative weakness, of the individual dimensions within the geographical area where the STP is located.

[30] Global Entrepreneurship Monitor, www.gemconsortium.org (ref 19)

Table 2.4 Dimensions of an Innovating Region indicating where STPs can best contribute

Dimension	Principal Providers for stimulating improvement	Other Providers
A strong knowledge base (KB)	Research Intensive Universities, Technical Universities, Industry focussed Research Institutes (e.g. Fraunhofer)	Corporate R&D centres
A good culture of SME enterprise and entrepreneurship	**STPs**, Business Innovation Centres (Euro BICs[31]), other Innovation Centres	Chambers of Commerce, Universities
Good knowledge transfer actors	Universities working from the knowledge base into industry. **STPs**, Institutes, Consultants working from the business base into the KB.	Private sector tech transfer operators and other professional services
A versatile and proficient knowledge management capability	Intellectual property consultants and lawyers and other professional services	**STPs,** BICs and Universities
Diverse and rich sources of risk finance to support entrepreneurs and SMEs undertaking innovation	Banks, VC organisations, Business Angel Networks (BANs), public sector funds (including regional, national and EU) managed by private sector fund managers	**STPs** and BICs acting as investment readiness actors and in some cases as fund managers or BANs.
Sources of highly skilled people and suppliers who can up-skill and supply the needs of KB sector companies.	Universities and other Higher Education Institutes	**STPs** through the provision of student project internship programmes in knowledge based companies
Services capable of supporting knowledge based start-ups and the growth of SME companies	Private sector professional services, **STPs** and BICs	Universities – particularly for spin-outs
Services to assist the formation and development of knowledge based business clusters	Universities, **STPs** and BICs, Chambers of Commerce	Chambers of Commerce
Services to signpost and draw together suppliers of innovation competencies and companies	**STPs**, BICs, Chambers of Commerce	Local and regional government (in their own name) in addition to funding some of the public sector led activity identified in this table
Good provision of affordable premises designed to meet the needs of knowledge based businesses	**STPs**, BICs, Incubators, Business Parks	Industrial Parks
Collaboration spaces and shared specialist facilities and equipment	Campus based business facing university institutes, other research institutes and special equipment facilities operated by these organisations for business benefit	**STP** located university and research organisation collaboration projects

[31] A Euro BIC is a Business and Innovation Centre (BIC) accredited to a standard set by the European Business and Innovation Centre Network (EBN). In some cases an entire STP may be accredited to this standard in other cases only parts of its activity are included within the accreditation. However most STPs whether partly or wholly are not Euro BICs and most Euro BICs are not full STPs in as much as their property offering only occasionally extends beyond incubation space.

The 'need' for a new STP

Therefore the 'need' for a new STP can be defined most readily as the perceived capability for an investment in an STP to close the gap in the performance of a local innovation ecosystem between where it stands today and what it might become through the development of a successful STP.

The use of the word 'perceived' when describing the prospective capability of a new STP is important. Before an STP is created, 'need' is often defined in political terms related to the socio-economic drivers illustrated in Table 2.4 above. Only when a sound feasibility study is conducted is there usually an appraisal of the strengths and weaknesses of the local economy, research base and innovation ecosystem.

However, many feasibility studies concentrate predominantly on the impact that the property services of an STP will deliver, in terms of:

- Providing types of space currently not available, or inadequate in quantity, within the local economy for the anticipated knowledge based business clients to start or grow
- Ensuring that start-up businesses and SMEs have access to affordable specialist premises that might improve their operational efficiency or reduce barriers to growth through under provision of appropriate premises
- Improving the opportunities to attract inward investors (both FDI and extra-regional inward investment) through high quality premises.

While property provision and services are important where provision is weak or inadequate, their effect can be magnified through additional services that amplify the effect of an STP's property offerings.

The three most important categories of additional services that address significantly different 'needs' are:

- **Shared services**. This includes provision of meeting and conference rooms, reception, telephony, internet access, café, etc. Mostly the services are provided to occupiers on the STP but some may also be provided more widely to other similar businesses. These services have the potential to contribute a modest net income to the STP although they are sometimes subsidised. The added value to the innovation ecosystem is small but the services are often valued by the occupiers as they can considerably reduce costs for users so they are meeting a 'need' that modestly helps the competitiveness of client businesses.
- **Signposting and networking**. These services are mechanisms by which an STP can contribute further 'glue' to the innovation ecosystem by helping companies to find the sources of advice, finance and other resources they need from within the existing infrastructure (signposting) or by bringing knowledge based businesses together from across the region for programmes of workshops and seminars (networking). Signposting is usually not a charged service while networking events are usually either free or charged at marginal cost. The

added value to the innovation ecosystem depends on the frequency of the networking events. Some STP networking programmes attract large regular attendances and become a feature of the high technology regional landscape at which point it is clear they are meeting an important 'need' not otherwise met.

- **Professional business support and innovation services**. There are many professional services that might be offered by a STP but some of the more usual, all targeted at start-up and growing SMEs, include: mentoring and business advice, start-up programmes (often linked to an incubator), access to finance, marketing, project based student and recent graduate placement programmes and open-innovation. These services are usually either subsidised or free. Where these services are: (a) carefully designed to meet the specific needs of innovation-led businesses at the start-up and early growth stages, (b) offered beyond the STPs walls and (c) there is an absence or clear weakness in alternative provision then these services will be contributing to a valuable 'need' by increasing the volume of small business innovation in the STP's locality.

Figure 1.7 (chapter 1) shows that the above services are regularly supplied by STPs and Table 2.5 confirms that such services are important features of a strong innovation ecosystem. Therefore it is increasingly important that feasibility work for a new STP includes an assessment of the 'need' for the above categories of services and particularly the professional services, so that the new venture is planned and resourced to deliver not only the property but also those services which most effectively boost the STPs value to the local innovation ecosystem.

The 'potential' of a new STP

The desired outcome from a new STP is a local or regional infrastructure that is more effective and efficient in turning knowledge and ideas into new high value added business activity which then contributes to the wealth of a region. However, attempting to forecast the incremental performance improvement of an entire local innovation ecosystem when an STP is added into it carries very considerable complexities and hence high uncertainty over the value of the result. Therefore while it may be of theoretical interest to conduct such an analysis it is not a realistic approach to assessing potential. Thus, rather than attempting to measure changes in the performance of the whole innovation ecosystem a more reliable approach is to establish the likely additional socio-economic outputs that a new STP should be able to produce through its property investments and services. The sum of these gross outputs then becomes a proxy for the STP's 'potential'. Table 2.6 which identifies the contributions the STPs make to their local economy is a good starting point for establishing the socio-economic outputs that are worth considering in this calculation.

It is quite normal for the calculation of a proxy 'potential' to form part of a feasibility study. However, to be meaningful the output estimates need to be based on a careful analysis of those STP features that determine likely success (described in chapter 3) within the context of the state of the local economy and existing innovation ecosystem. The presumption of near ideal local economic conditions or the underplaying of likely shortcomings in any of the STP success factors will lead to a

gross overstatement of the total value of the outcomes or the time by which they are achieved or both.

Ideally, to reach a value for 'potential' from the proxy estimate requires a further level of analysis. This involves deploying the evaluation techniques described in chapter 4.

Far harder to predict is the impact that an STP may deliver as its scale and range of services increases. About 15% or more of European STPs believe that they are becoming a 'highly visible centre for technology and innovation in their local area' (see table 2.4). When this happens it will reinforce the STP's ability to draw together the key innovation players in both the public and private sector for the benefit of knowledge based businesses both within and outside the park. The STP will then be in a virtual upward cycle leading to significant economic impact. This type of outcome is very difficult to predict as to either timing or extent but it is nevertheless an appropriate vision for a new STP.

A review of the economic impact that some of Europe's more successful and longer standing STPs have achieved or contributed significantly towards would be a valuable line of research for the future.

Conclusions

STPs sponsored by public sector bodies should be established and managed to deliver aspects of a regional or national innovation ecosystem that are clearly insufficient in quantity or inadequate by their nature for the healthy functioning of industrial innovation in the knowledge based sectors of a local economy.

To be successful, an STP needs the presence of a good research base and must be effectively linked to it for the benefit of its client companies. The STP also needs to be effectively engaged with other organisations in their locality that make up the key components of the innovation ecosystem, whether these components come from government, industry or the research base. An STP needs to establish their presence with these parties from the outset then seek to create a role for themselves that will enhance the overall effectiveness of the innovation ecosystem. The STP's role needs to be recognised, understood and valued by the other innovation actors as well as by their clients. This approach gives the best opportunity for securing the resources for the delivery of the STP's mission thus improving the prospects of securing sustainability as well as generating outputs valued by sponsors and stakeholders.

Strong leadership of an STP project, both at Board and chief executive officer level is also a key determinant of success. Unless the leadership is highly respected by the leaders of the other components of the local innovation ecosystem collaboration becomes difficult, public resources may be withheld and the STP may become relatively isolated with its effectiveness reduced.

The 'need' to establish a new STP can be derived from an analysis of the multiple dimensions that constitute an existing regional innovation ecosystem. The extent to which a new STP can bridge gaps

in dimensions that are known to be weak or only moderately well supplied identifies the magnitude of the 'need' and the diversity of services that it should be designed to supply.

The usual method for assessing the prospective 'potential' of a new STP is to quantify the employment, new business starts and inward investment that the project can be expected to develop. The quantification has to take into account the established success factors for STPs, moderating outputs where those factors are not fully present. However, the assessment of 'potential' has to take into account that an STP performs best when the local economy is diversified, has a solid research capacity and a recognisable industrial base. This ensures that the STP can both take inputs from the local economy as well as making its contributions to the knowledge based economy as it delivers its mission.

Further research on significant economic impact arising from longer standing European STPs would be a useful line of research as an adjunct to the more usual assessments of 'potential'.

3 How to conceive a new STP

What is important in choosing a model and partners

In order to succeed STPs need to engage a range of partners, each pursuing different agendas and bringing to bear different skill profiles, while using property to help anchor knowledge based business in a particular locality.

To achieve this wider role, the following issues have crucial importance:

- Setting out the strategy and objectives of the new park and deciding on the best model for implementation
- Engagement of the knowledge base
- Interaction with the public sector at local/regional, national and European level
- Securing the land, capital and revenue to establish the STP and ensure its on-going growth
- Assessing the nature of the local skill base
- Addressing the availability of regional and national markets or corporate supply chains
- Selecting the package of services to deliver to tenant companies and businesses in the wider economy
- Deciding on the appropriate science park model.

Setting out the strategy and objectives of the new park and deciding on the appropriate model of engagement

The early stages of a science park are crucial in deciding on the key dimensions of the project, what to aim for and how to achieve it. This is the time when concept and feasibility studies will help to clarify the outline and shape of the park including the participation of different players. The next sections discuss the key ingredients for a science park and the different models of engagement.

Engagement of the knowledge base

Foremost amongst the partners – and indeed often the main champions for the development – are representatives of the 'knowledge base'. Most frequently this refers to universities, also known as Higher Educational Institutions (HEIs). Other 'knowledge base' partners can be hospitals, particularly those that are research-based, large enterprises, especially those which devote significant resources to research and development (R&D), or research institutions operating in the private or public sphere.

The constituent parts that make the knowledge base such an important ingredient in STP development relate to a range of factors including:

- By undertaking basic, strategic and applied research – thereby generating technology and innovation to be commercialised by businesses on the park
- On the basis of their propensity to encourage the creation of spin-out companies – thereby producing potential tenants for the park
- By being a source of employees and entrepreneurs and by offering training and education for further skills development
- Through the generation of 'knowledge' relevant to society at large

- Through the effects of scale and reputation – influencing the quality of life of their host locations, producing economic impacts by being a large employer and producing image benefits to the park and its tenants. The latter are particularly important in the case of universities with long standing reputations.

Before moving on to explore how best to engage the knowledge base, the following section explores these four factors in more detail.

Research

Knowledge base partners tend to be engaged in a wide range of basic, strategic and applied research and development activities. Unless conducted in a private laboratory, research and development are pursued foremost as 'public goods', to benefit society through furthering knowledge. However, not all research can be properly utilised just by the dissemination of results. There are some research findings that increase their usefulness by being developed as commercial products or services ('commercialised'). In undertaking this commercialisation, research organisations and their commercialisation partners come to an agreement of the value of this 'intellectual property' (IP) thus commercialised and relative value for each partner.

Research commercialisation is important across all spheres of society and is particularly prominent in industries such as information and communications technologies, medical technologies, life sciences, engineering, materials sciences and many more. There are many routes to commercialisation which can happen on the basis of close relationships with individual businesses, groups of businesses or by taking out and selling patents and offering licenses. This process of commercialisation is increasingly encouraged by the public sponsors of research as a way to facilitate innovation and enabling knowledge base partners to achieve a commercial return on their investment.

Science parks can be very helpful as conduits for research commercialisation for a number of reasons:

- They allow for physical proximity between public and commercial partners engaging in joint commercialisation activities
- They provide good homes for small businesses pursuing the commercialisation of research results including company spin-outs (see below)
- They create communities of like-minded companies engaged in research and development activities.

Spin-out companies

Spin-out companies are businesses set up by students or academics associated with the knowledge base. In some instances, founders retain their research or teaching position. Indeed, some knowledge-based organisations emphasise the route into self-employment and entrepreneurship and are supportive to those wanting to pursue commercial opportunities, provided the ownership of IP is clearly decided and arranged. It is also not unusual for knowledge base organisations to take an equity stake in a business, either in recognition of their contribution in creating IP with public funds or, if no such direct IP attribution exists, purely as a commercial decision.

Science parks, in particular those who operate incubator facilities for small businesses, are an obvious home for spin-out companies, providing them with a nurturing business environment as

well as physical proximity to laboratories and research groups with which they normally retain close links.

Manpower, education and training activities

Knowledge base organisations tend to attract clever people and educate them at all levels of their career. Education and training happens through structured programmes at varying levels of advancement and depth as well as through 'learning by doing', working with leaders in specific fields of research, development or commercialisation.

Once people have made their career in a place and have developed their personal and professional networks, they often like to stay on, whether or not they change career. Students at the undergraduate, graduate or post-graduate level may consider leaving once they have reached their desired degrees but if the right opportunities present themselves they may also stay. These individuals are potentially available to work in businesses in the local economy in general and in the science park in particular. Alternatively, they may consider setting up their own business as an entrepreneur.

Science parks can play an important role in utilising and further boosting the local skills base by creating opportunities to work in companies that are using these skills to greatest effect in an innovation environment. This applies both to technical and engineering skills as well as to business development and entrepreneurship.

Generation of knowledge of relevance to society at large

Universities and research institutes are sources of knowledge to society at large and thereby can play an important role in shaping approaches to a wide range of issues in the sphere of politics and the commercial sector. While there might not be a direct impact on the associated science park, constructive activities in this sphere will help build the reputation of the knowledge base partner.

Scale, impact and reputation

Knowledge base organisations in general – and universities in particular - are sizeable organisations which shape the quality of life and work of their host locations. They create a wide range of employment opportunities (not just for academic staff but also for supporting occupations) as well as acting as procurer of goods and services. They therefore help to create favourable labour market conditions which make it relatively easy for science park companies to find and retain employees.

In terms of quality of life benefits, knowledge-based organisations encourage the establishment of sports, culture and leisure facilities, all factors that attract and retain employees.

An additional positive impact comes from the reputation of often old established organisations as sources of knowledge and progress. Universities in places such as Aachen (Germany), Bologna (Italy), Cambridge (United Kingdom) or Leuven (Belgium), to name just a few, have a long standing reputation of academic excellence and science parks benefit from these image and reputation factors.

How best to engage knowledge base players

Engagement of knowledge base players can be of different types:

1) As founders (or co-founders) of the STP
2) As active partners in developments led by others such as economic development bodies, local and regional authorities or private sector businesses. This includes arrangements where more than one knowledge base partner supports the development as a group or consortium
3) As passive partners that support the overall aims and objectives of the STP but do not play an active role in their success.

Without being too prescriptive about the engagement of the knowledge base, it is the first two approaches (as founder or active partner) that tend to yield the best results in STP development because as outlined earlier in this chapter, the knowledge base partner potentially brings a wide range of benefits to the scheme and to access them fully requires close engagement. Whatever the chosen arrangement, the knowledge partner needs to share and support the mission of the park.

Engagement as founders (or co-founders) of the STP

This is a model pursued by organisations that see a very close fit between the STP and their own strategic objectives. These tend to be business facing institutions for which close linkages with companies and commercialisation of their IP is of very high importance.

Engagement as STP founder can involve any of the following:

- Assuming the role of 'project champion', developing the concept and strategy of the park and coordinating professional advice on the basis of technical and commercial feasibility studies. Any major project needs a champion to feel passionately about and move it along, addressing obstacles on the way
- Communicating and promoting the concept widely to their own staff and outside partners. To be effective, there needs to be wide awareness of the science parks by all key players within and outside the knowledge base organisation. For example:
    - Senior academics need to know about it in their regular dealings with national and international partners; in this way, they can become 'ambassadors' of the scheme and help with its marketing
    - Anybody considering a spin-out business needs to be aware of it and in fact in some instances the availability of a supportive environment for the development and growth of companies might even encourage individuals to go down this route
    - Partners and stakeholders concerned with the economic wellbeing of their area have to build it into their plans for business support and inward investment attraction
- Providing the land on which the STP is being developed or allocating some unused buildings where companies can locate. This can be by dedicating existing holdings of land and buildings to the park or by acquiring new ones
- Funding capital expenditure including site and/or off site infrastructure and the construction of science park buildings
- Employing and funding the management team for the park. As emphasised before, STPs are NOT just property developments but perform a wide range of wider objectives. To achieve their potential, they need to have a dedicated management team, ideally headed by a science park

director, who heads the strategic and operational tasks involved in establishing and running a science park. Management teams need to consist of professionally experienced individuals who understand (and have relevant career experience in) all relevant areas including technology transfer, enterprise development as well as property development. Not all areas of expertise need to be covered in-house; it is quite possible to buy in specialist services in all relevant areas. However, the science park management team needs to have a good grounding in all relevant areas in order to be able to act as an intelligent client.

As active partners in developments led by others

For STPs where the lead role is assumed by another organisation (such as a local authority, a regional development agency or a private sector organisation), there still needs to be enthusiastic support for the development in order to bring to bear all the potential benefits that can stem from the knowledge base partner. The needs for communication and promotion of the park within the knowledge base organisation are as strong (if not stronger) than in the first model because the visibility that comes from being a project champion and founder is not guaranteed.

There are some degrees of freedom how such an active partnership is configured. Possible models include:

- Through representation on the STP board. Even though the knowledge base organisation is not a founding partner, it could still be a key partner in the board and be strongly engaged in key strategic decisions concerning the park
- By delivering services that are supporting the development of the park and its tenants. These could include training and awareness programmes for students and academics or technology and business support to science park partners. Such services could be provided on an ad hoc basis or they could be specified through service level agreements
- By opening up knowledge base services and facilities to outside partners. These could be special telecommunications services, access to libraries and technical information sources, bulk purchasing of consumables, access to leisure and sports facilities and many more.

As passive partner in developments led by others

While there are scenarios where the knowledge base partner plays a passive role in the development of the associated science park, these arrangements cannot be considered as optimal. As a passive partner, the knowledge base will never truly bring to bear the wide range of benefits that should flow from its engagement. There are fewer occasions when these arrangements produce one of the more successful parks.

Interaction with the public sector at local/regional, national and European levels

Public sector bodies are often instrumental in the conception and implementation of a science park. They can support the science park in many ways including as a founding partner, sponsor, service provider or client. The roles and responsibilities which public sector bodies assume depends on the interest they take in economic development, the range of responsibilities they assume and the scope for action they command. The table below shows some possible scenarios.

Table 3.1: Engagement of different categories of public sector players

	Local authority	Regional development authority/agency	National/ central government	European level/ International agencies
Planning permission for the STP site	Unless the site has planning permission, it cannot be developed	If appropriate, working with local authority	Generally outside remit	Outside remit
Donation of site	Depends on ownership of site	Depends on ownership of site	Unlikely – unless it is a site in national ownership	Outside remit
Strategic support such as membership in STP Board	Possible – although not essential	Possible – although not essential	Possible – although not essential unless in national interest	Generally outside remit
Provision of other capital support	Possible – although local authority budgets tend to be constrained	Possible – although regional development agency budgets tend to be constrained	Through central government programmes	Through development funds such as ERDF
Provision of general revenue support	Possible in the early stages – although local authority budgets tend to be constrained	Possible in early stages – although regional development agency budgets tend to be constrained	Unlikely	Unlikely
As a client for innovation and enterprise services and programmes	Crucially important	Crucially important	Crucially important	Crucially import
As a 'good will ambassador' of the STP	Crucially important	Crucially important	Important – but more with respect to the networks of national parks rather than individual parks	For science parks as a concept and approach

In order to be effective, science parks need to form close links with all levels of government and work out how best to forge links and access support.

Securing land, capital and revenue to establish the STP and ensure its on-going growth

Considerations in identifying a site

The ideal site for a science park needs to be evaluated on a number of criteria:

- **Proximity to the knowledge base**; the closer the site is located to the knowledge base organisation, the easier it is to forge strong linkages between science park tenants and members of the knowledge base. Some science parks are developed on the campus of the knowledge base partner, benefitting from services. There are, nevertheless, models of science parks which are located some distance away from their sources of knowledge. In these cases, special efforts need to be made to bridge the distance by a wide range of measures
- **Visibility**; particularly in the early stages of a science park when it needs to overcome lack of awareness, visibility in a prominent location helps to promote it effectively. If not close the knowledge base, locations might be close to a major road or transport interchange
- **Accessibility**; it is essential for a science park to allow for easy access by a variety of transport links including road and rail. Given the global ambitions of technology-based companies, it is also desirable for a science park to be in relatively easy access of an airport which allows for travel to international business centres
- **Size**; determining the appropriate size of a science park is complex. In the early stages, a relatively small parcel of land of a few hectares allowing for one or two initial buildings may well be all that is needed. However, if the park takes off as hoped for, it will be important to allow for expansion space to ensure that the momentum created can be continued and maybe even accelerated. Therefore, when planning a science park, it is helpful to have a site big enough to accommodate significant growth. On the other hand, care needs to be taken not to be too ambitious right from the beginning, hereby risking to be seen as a 'failure' while the park may well have developed in line with its initial plans and ambitions. Demand assessments will help to determine the appropriate size of the scheme but in locations where the science park concept is new, demand assessments do not always generate satisfying results. While science parks can take a long time to build up momentum and dynamic, once they are seen as a good location for technology-based businesses demand can build up rapidly and way beyond the expectations for growth that would have been picked up before the scheme started to be developed
- **Availability for science park purposes**; the site has to have planning conditions and ownership status that allow the science park to be developed within a foreseeable time schedule and without undue physical constraints
- **Potential for landscaping**; science parks are characterised for low density development and generous landscaping, making them pleasant locations to work. In order to achieve generous landscaping, the allocated site needs to be? big enough. There are, however, environments (in particular in inner city locations) where landscaping may only be a accommodated at the cost of space provision; in such cases, other efforts can be made to create conducive working environments such as roof terraces and gardens or high quality sports and leisure facilities
- **Value and price**; the value of the site or its purchasing price will be a consideration in exploring the financial viability of the scheme. If the site is already in the ownerships of the science park, the value of the site will enter the considerations as an opportunity cost rather than a direct cost.

Considerations in determining the size and type of buildings to be constructed on the park

Science parks tend to offer a mixture of buildings including:

- Multi-occupancy buildings which offer a range of office and workshop space to companies who do not require their own 'front' door but prefer the convenience of sharing a building and facilities with other businesses and tenants. This may include facilities for very young and small businesses such desk rentals and charge by the hour mobile office space
- The first multi-occupancy building on a science park often doubles up as an 'incubator' or an 'accelerator' (providing a range of services to help fledgling businesses) and/or an innovation centre (offering innovation support for businesses to develop and market its products and services). Experience from a number of science park developments has shown that a serviced multi-occupancy building should be at least 3,000 square metres in size to allow for a critical mass of tenants and economies of scale in the provision of services
- Collaboration spaces, sometimes integrated into one of the multi-occupancy buildings
- Free-standing buildings for larger tenants (often those that graduated from a multi-occupancy building helping them to accommodate their growth)
- Sites for long leases or sale where large tenants (often inward investors) can develop their own buildings.

Kilometro Rosso Science Park, Italy

The heart of a modern science park is often called 'a hub'. It consists of different types of buildings allowing for frequent formal and informal interaction between different communities, an environment where both planned and serendipitous innovation occurs. Innovation beyond pure research relies on active exchange between many people to take ideas, develop technologies and systems and commercialise them to meet market opportunities. It is a highly professional "contact sport". People need to meet and collaborate at the levels of one-to-one, in small groups or facilitated workshops, in seminars and in conference mode and each of these modes can be in-person or virtual or a combination of both. The few meeting rooms often found in incubation centres may fulfil part of this need but these facilities are inadequate to cover the above spectrum of interactions. Furthermore, there need to be players like University Institutes who plan and orchestrate programmes using purpose designed and technology sector specific facilities that are directed towards technology transfer and business innovation and sometimes spin-out businesses.

- **A 'business centre'** which can include business incubation units and small units for teams engaged with university collaborations where the purely commercial aspects of their roles can be conducted and for small teams from supply chain technology companies working with the primary business collaborators. This building would also house the management team of the

science park and would be the base for any professional business support, innovation and access to finance programmes operated by or through the park to accelerate start-up and SME client growth. A social meeting place such as a café for snacks and lunches is normally a part of the centre as are a few meeting rooms for the use of any occupiers on the park.

- One or more **academic institutes** which provide the primary university and business collaboration space on the STP. These institutes can be valuable in building demand through the establishment of business facing university institutes with innovation programmes that involve collaborations with larger businesses and their technology suppliers.

- **A 'training centre'** (sometimes a hotel with good conferencing facilities) which can usefully include a good dining room / restaurant and bar area and possibly a small fitness centre. This is a secondary collaboration space often of considerable value to a university for the training activities that companies sign up to as part of an overall collaboration package. But it is also of considerable value to companies for training customers in the use of new technologies and techniques they have developed.

Scion DTU Science and Technology Park, Denmark

The above buildings are sometimes collectively known as a "park centre" or "park hub" as they are the places where both formal and informal interactions occur and the places where the knowledge base organisations and park management are most likely to operate their principal proactive business and innovation programmes. Ideally, these buildings should be at the focal point of the STP and relate to each other physically thereby encouraging the staff of the park companies to see this part of the park as a natural extension of any other building that they occupy. They are also the buildings that need to be built during the early stage of the STP's development.

As the park grows the majority of the buildings will be either:

- Larger units in multi-occupier buildings. These are needed to take the growth of businesses from the incubator units, the growth of tech companies coming to the STP from outside the park or teams form larger technology companies establishing a regional presence.
- Owner - occupied or rented buildings developed to accommodate a single organisation.

Naturally the building construction schedule needs to reflect the availability of capital funding. Multi-occupancy buildings have to be completed before the first income stream from rentals and service charging is realised and quite frequently there needs to be an allowance for empty space as capacity utilisation builds up after the first year of completion. It is in those cases where uncertainties in occupancy levels make such multi-occupancy buildings relatively high risk ventures that grant support from national or European sources is most useful.

Surrey Research Park, UK

The funding of free-standing buildings for specified tenants is easier as these tenants either finance their own construction projects (in line with design guidelines and specified development densities) or enable loans to be secured by the property developer against the envisaged rental stream. Sites for long term lease may require the provision of on- and offsite infrastructure but the buildings are often financed by the large tenant themselves. An analysis of when building finance needs some public sector support or can be financed by the private sector is provided at chapter 6.

Capital expenditure and funding

Science parks are large capital developments. The main categories of capital spending are:

- Land acquisition costs. Depending on the ownership of the site parcels, these costs can be significant. Site ownership can become an important criterion in evaluating different site options. If the preferred site is already in the ownership of one of the science park partners it can significantly facilitate the process
- Site development costs such as site clearing, levelling, landscaping, development of the internal road network and putting in facilities and services such as energy, water and telecommunications
- Off-site development costs such as new access roads and traffic junctions
- Construction costs for buildings that fit the design guidelines of the park in terms of external and internal specification.

While they require significant capital expenditure, science parks also generate a stream of revenue from rents and services which can be used to pay for – and ultimately pay off – the debt incurred in developing them. Moreover, once the park development gains momentum and reaches a reputation for success and becomes a desirable location, its property value tends to increase and the value of site parcels which might be sold to large occupants goes up. Recent reversals in property values as a result of the credit crisis will probably restore the trend in due course. Some science parks have emerged as very successful commercial ventures, generating a steady income stream for their associated partners and increasing manifold in asset value.

It is ultimately left to the partner organisations whether they want to continue owning and managing the science park, taking responsibility for all its functions in return for a steady revenue stream, or whether they want to sell it on to another body such as a pension fund or a commercial organisation. If sold on, the capital value of the development is realised and can then be used for other purposes including research, development and education. This route has been taken by some university-linked science parks. However, in these instances there is a concern whether the wider objectives which prompted the knowledge base organisation to get

involved in the first instance may be jeopardised as those taking over purely for commercial objectives may not be as prepared to pursue the wider objectives.

The nature of the local skills base

To be effective, science parks require a wide range of skills, both for the *companies* it attracts as well as the *management team* of the park.

In terms of *companies*, there is a foremost a need for *entrepreneurial skills and attitudes*, requiring individuals ready to take risks to set up knowledge-based businesses and growing them successfully. Some of these skills are internal to the knowledge-based company while others are vested in a wide range of supporting businesses expert in financial management, accounting, marketing and IP protection.

There is extensive debate about the entrepreneurial credentials of countries and local economies. As discussed in chapter 2, the Global Entrepreneurship Monitor (GEM) project is an annual assessment of the entrepreneurial activity, aspirations and attitudes of individuals across a wide range of countries. It distinguishes between different types of economies (factor driven, efficiency driven and innovation driven) and makes entrepreneurship comparisons within each category. There are some countries that stand out as being particularly entrepreneurial in their category, for example the United States and Australia as innovation driven economies and China and Chile as efficiency driven economies. [32] Within countries, further disaggregation often reveals differences in the entrepreneurial credentials of regions. For example, regions where economic activity used to be dominated by large scale businesses such as steel and shipbuilding tend to score relatively low on the entrepreneurial scale and require time to overcome any traditional obstacles in attitudes towards entrepreneurship and risk.

The implications for science parks are complex. Ultimately, they have to operate within their economies, building on strengths and addressing weaknesses. In economies rich with entrepreneurial credentials, they can work within a supportive environment which facilitates a rich stream of business start-up activity. In economies short of entrepreneurial talent and attitudes, one of their functions is to highlight business creation and growth as an alternative path to income and prosperity and help address obstacles for individuals wanting to pursue their business ideas. Indeed, it is in such economies that science parks can play a particularly beneficial role not just in terms of IP commercialisation and innovation but more generally for business development and growth. Moreover, it is deficits in entrepreneurial credentials which are often the market failure identified by regional, national and international governments that warrant intervention generally and support for science parks in particular.

In addition to the entrepreneurial skills and attitudes, knowledge-based companies also need to access a wide range of technical and creative skills and competencies necessary to develop, produce and sell innovative products and services. Such skills develop through formal education as well as in the course of professional work experience. In this way, both educational providers (foremost the associated knowledge base organisation) as well as businesses operating within the science park catchment all play a role in developing the local labour market.

[32] Donna J Kelly, Slavica Singer, Mike Herrington: The Global Entrepreneurship Monitor, 2011 Report (ref 19)

Generally, labour markets for knowledge-based businesses develop with the success of their knowledge economies, setting in train a virtuous circle whereby success generates further success. Quite often, in the early stages of a knowledge economy, businesses have difficulties recruiting employees with the right skills because individuals moving in from outside the area can be concerned that if the job they are moving for does not work out, they might find themselves without work. The more developed the knowledge economy becomes, the more opportunities for good careers offer themselves and the richer the supply of skills becomes. Science parks can play a role in this transformation by being a beacon for the ambitions of an area to transform itself into a knowledge economy.

Not all skills necessary to develop knowledge-based companies are internal to the companies themselves. Some competencies and services such as IP management, financial engineering and the provision of venture capital are often vested within companies operating in the knowledge economy. In many ways, the arguments that apply to the labour market becoming richer in the course of time also apply to the community of supporting businesses. The more demand there is for services for these specialised businesses, the more interested they will be to be present in the knowledge economy. Again, science parks can play an important role in attracting such companies, sometimes in the beginning encouraging them to develop a low key presence in the first instance. Office share arrangements whereby business services specialists get (sometimes rent free) accommodation and meeting spaces in the science park help to develop their presence step by step.

The last category of skills relates to the development and management of the science park itself. This includes the skills involved in the property development stage (site acquisition, preparation and building construction) as well as the management once the park is opened including landlord functions, linkage strategy and tenant support. In addition to their level of skills, science park managers benefit from social skills that translate into effective networking and communication. Some national and international science park associations such as the International Association of Science Parks and Areas of Innovation (IASP) and the European Business Innovation Centre Network (EBN) are exploring opportunities for quality marks and educational initiatives to ensure that science park managers get effective support for their activities.

Governance models

Governance in the context of a science park relates to the structures set up for strategic and operational decision-making and the reporting arrangements within them.

Governance sets out answers to a number of questions:

- What is the legal status of the science park
- Who owns the site and its different parcels
- Who funds the development of the sites and buildings
- Who makes strategic decisions
- Who makes operational decisions
- What are the reporting arrangements?

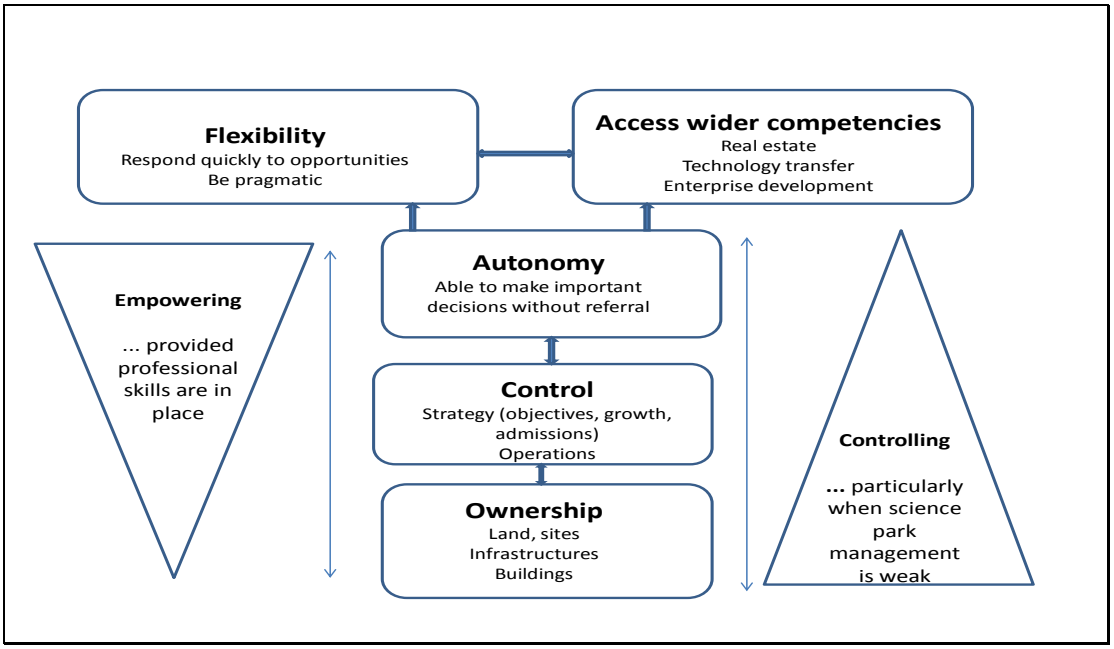
By their nature, these different dimensions of governance issues are interrelated. For example, strategic decision-making is linked with ownership and funding and the legal status of a science park will reflect ownership and funding.

In determining the appropriate governance model, partners need to reach clarity on a number of dimensions:

- *Ownership* – who owns the land, sites, infrastructures and buildings that constitute the park
- *Control* – the extent to which partners want to keep some level of control over the development of the park and how far they are prepared to relinquish this control. This may reflect ownership but not in a straightforward relationship
- *Autonomy* – in order for any park to achieve its full potential, it needs to be developed and managed in an entrepreneurial way and this will be facilitated by having a fair amount of autonomy vested in the park management, allowing it to make strategic decisions that predominantly serve the interests of the park. However, in some cases partners may be reluctant to grant this autonomy
- *Flexibility* to respond to the market – science parks operate in a constantly changing market environment which will be influenced by the state of the national and international economy and the availability of particular market opportunities. There will be merit in allowing the park to address opportunities arising quickly and flexibly
- *Harness the competencies of others* – partners can play a key role in making a science park a successful venture but in order to bring their competencies to bear, they may want a share in the strategic decision-making and maybe even the ownership.

The relationship between these different dimensions is summarised below in the picture below.

Figure 3.1: STP Governance considerations



In reality, there are almost as many science park models as there are science parks. Decisions have to be taken on a wide range of issues:

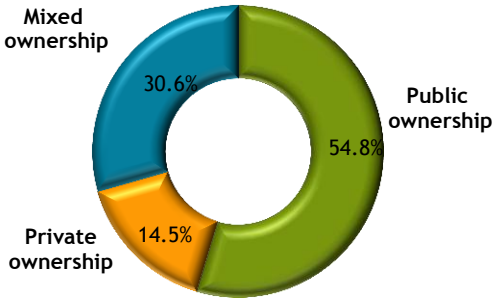
- Will there be a separate science park company or will the park be a division of one of the partner organisations
- Who owns the assets in the early stages of the park development; does ownership change over time

- Will there be an external board with membership of wider partners and stakeholders or will the science park be run basically by the main sponsoring organisation
- What are the key performance measures for the park
- What is the balance between financial and wider economic development objectives and targets
- To whom does the science park management team report and at what intervals?

Across Europe there are many different STP governance structures but there is no detailed classification available for those structures and the implications for success. What is known are the broad statistics relating to ownership as shown in Figure 3.2 below.

Figure 3.2 General EU STP ownership statistics

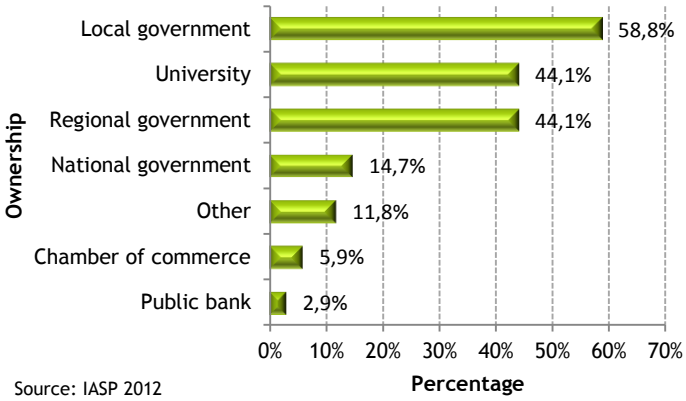
Figure 3.2a Ownership of EU STPs



Source: IASP

The public sector clearly dominates ownership but that ownership in turn is made of many different public organisations but with local government, universities and regional government being the major players as shown in Figure 3.2b. The average number of owners per STP is 1.8 in this category.

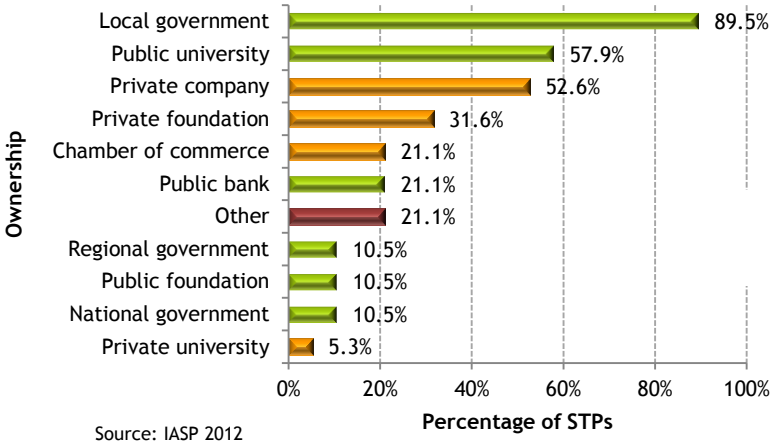
Fig 3.2b Public ownership of EU STPs



Source: IASP 2012

The ownership patterns in the mixed ownership structures again show that local government plays a critical role occurring as an owner in nearly 90 % of mixed cases, but Universities are included as owners in 58% of cases of mixed ownership with private companies occurring as owners in 53% of this category. Mixed structures are on average the most complex with an average of 3.3 owners per STP.

Figure 3.2c Mixed ownership of EU STPs



Source: IASP 2012

Privately owned EU STPs which represent just 14.5% of the population had the simplest structures with one owner per STP and the dominant owners are private companies having control of 66% of cases. Private Universities and Foundations from balancing owners of 33% of private sector STPs.

Financial imperatives and success

Science parks require extensive funding throughout their development. After a period of time, most schemes reach a point where they start paying back some of the funding through income streams from rentals and service charges as well as benefiting from appreciating asset values. However, in the majority of cases, science parks are not developed solely for the purposes of financial reward but for a wider set of objectives. Purely on the grounds of financial rewards there are likely to be a whole raft of alternative ventures that attract higher rates of return and more favourable risk/return balances.

Science parks can become very successful commercial initiatives but in order to achieve this stage generally require 'patient' money which sacrifices short term results in exchange for the long term development of a product which is sustainable and achieves wider objectives.

Models

As discussed earlier, there are almost as many models of science parks as there are parks. The table below provides examples of parks that are following some of the more familiar models.

Example	Lead partner (s)	Supporting partners	Management
Technologiepark Heidelberg GmbH (Germany)	City of Heidelberg Chamber of Industry and Commerce Rhein Neckar	University of Heidelberg and a number of research institutes, particularly in the sphere of medical research and life sciences	Management company: Technologiepark Heidelberg GmbH; Owner of the buildings: PPHD II GmbH and Co KG, owned 100% by Sparkasse Heidelberg Lettings: RN Immobilienmanagement GmbH Rhein-Neckar
Loughborough Science and Enterprise Park (United Kingdom)	Loughborough University	Charnwood Borough Council Leicestershire County Council	Currently managed as a division of the University; new management company likely to be set up soon to manage expansion of the park
Ideon Science Park (Sweden)	Lund University	The City of Lund Wihlborgs a property developer that is the majority shareholder of Ideon AB	Managed by Ideon AB, an independent company owned by the partners. Governance is through a Board with shareholders, the CEO and an independent chairman
22@Barcelona	Barcelona City Council	UPF, UB, UPC, BDigital Foundation, Barcelona Media Foundation, BTech, BCD.	Barcelona Activa + 22@Network

Other more detailed descriptions of ownership models and governance structures are provided in Annex 5.1

Conclusions

There are almost as many models of science parks as there are science parks. Every development is different, addressing a specific set of local circumstances, assets, opportunities and problems.

Despite this variety, there are a number of key factors which are crucial for the development of new parks:

- A science park depends on a close relationship with a knowledge base partner; without such a link, it is difficult for the park to distinguish itself from an ordinary property development
- The knowledge base partner impacts on the park in many different ways, in particular through links in the field of research, technology transfer, commercialisation, education and training
- Other less tangible impacts including image and reputation are difficult to measure but tend to be crucially important
- Science parks are partnership initiatives and need to work closely with key organisations at the local, regional, national and international level
- Site selection criteria include proximity to the knowledge base, visibility, availability, accessibility, size
- Science parks tend to offer a mixture of buildings catering for the needs of different clients/tenants
- Multi-occupancy buildings offer a range of office and workshop space to companies who do not require their own 'front' door but prefer the convenience of sharing a building and facilities with other businesses and tenants
- Some multi-occupancy buildings include facilities for very young and small businesses such as desk rentals and charge by the hour mobile office space
- The first multi-occupancy building on a science park often doubles up as an 'incubator' or an 'accelerator' (providing a range of services to help fledgling businesses) and/or an innovation centre (offering innovation support for businesses to develop and market its products and services)
- Experience from a number of science park developments has shown that a serviced multi-occupancy building should be at least 3,000 square metres in size to allow for a critical mass of tenants and economies of scale in the provision of services
- Many science parks also offer 'collaboration spaces' for short to medium term collaborative activities. Such central 'hub' buildings allow for extensive interaction between many different communities of interest and facilitates 'managed serendipity' which is essential to translate research results into innovative solutions
- As the science park grows and consolidates its reputation, it tends to offer more free-standing buildings for larger tenants (often those that graduated from a multi-occupancy building helping them to accommodate their growth) as well as sites for long leases or sale where large tenants (often inward investors) can develop their own buildings
- There are many governance and partnership models but whatever model is chosen, the knowledge base partner should be an active component of the development
- Some parks have a separate science park company while in others, the park is managed as a division of one of the partner organisations

- Decisions will need to be taken on ownership of assets at the beginning and over time, whether there will be an external board with membership of wider partners and stakeholders or whether the science park be run basically by the main sponsoring organisation
- Other issues are concerning the key performance measures for the park and the balance between financial and wider economic development objectives and targets
- In reality, there are almost as many science park models as there are science parks.

4 How to evaluate existing STPs

What is evaluation?

Evaluations explore the impact of an initiative on its local, regional or national economy. Evaluations revisit the reasons why the initiative was developed in the first instance and explore whether it had the desired effects.

Evaluations tend to ask two key questions: "what did you want to change?" and "how would you know if you have changed it". "These evaluation questions are not just bureaucratic requirements but the essence of good programming. Impact evaluation mobilises scientific and statistical tools to follow up on these questions."[33]

Evaluations revisit the "theory of change" that informed the initiative, looking back at its original rationale and what it was trying to achieve. An illustration for the theory of change for a science park is summarised in Table 4.1 below.

[33] http://ec.europa.eu/regional_policy/information/evaluations/guidance_en.cfm#2 (ref 20)

Table 4.1: Theory of change underlying science park evaluations

Issue	Explanation	Examples
Market failure and rationale	What is the problem the initiative is trying to address	• Knowledge-based start-up companies face adverse conditions • There is no risk capital to be invested in innovative ideas • Knowledge-based employment is growing less rapidly than in competing locations • Innovation is inhibited because there is insufficient awareness of the beneficial effects stemming from it • Knowledge base institutions are reluctant to work with third parties • IP is not commercialised.

Baseline	How can the problem be measured on the basis of verifiable indicators	• Knowledge economy performance worse than elsewhere
		• Measured for example by:
		  ○ Numbers of company start-ups
		  ○ Venture capital investments
		  ○ Patenting and licensing activities
		  ○ Employment in well paid high tech sector jobs

Activities	How is the problem to be addressed – what exactly is to be done	• Undertake concept and feasibility study of new science park and implement it • Develop a placement scheme for university students • Stimulate small business development through an incubator
Inputs	What are the costs? What are the resources (money and in-kind) to be devoted to addressing the problem	• Capital expenditure on a science park • Operational spending on the science park management team
Outputs	What will be the initial results	This list can be very long, reflecting the specific nature of the initiative. For example: • Site prepared • First building erected and occupied • Management team employed • A range of animation measures undertaken • Specialist business advice provided
Outcomes	What are the long lasting effects	• Knowledge-based companies created and supported • Job opportunities in knowledge-based jobs created and supported • Innovation opportunities realised in companies
Impacts	How has the knowledge economy developed	• A richer and more successful knowledge economy that can compete internationally

Another way of describing the impact is summarised in Figure 4.1 below. The process starts with an analysis of the contextual conditions and problems which the initiative is aiming to address.

Source: Monck/Peters: Science Parks as an Instrument of Regional Development; proceedings from the IASP 2009 conference[34] (ref 21)

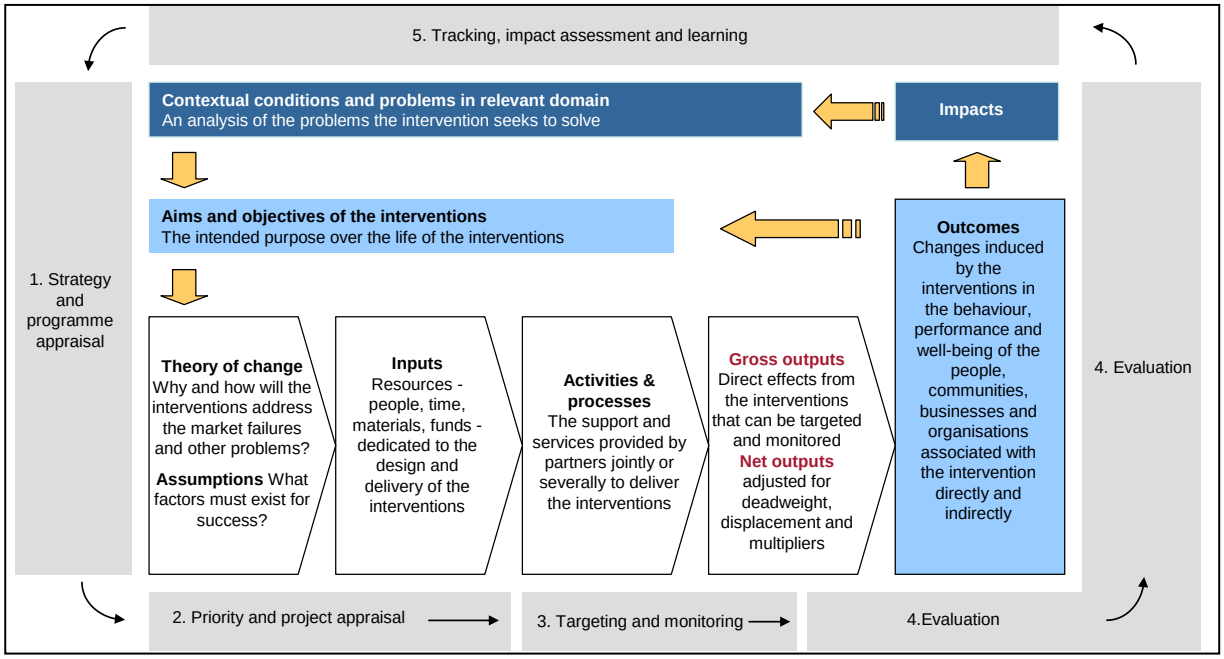


Figure or 4.1: The evaluation cycle

The outside components of the cycle (shaded in grey) describe the generic evaluation cycle at the programme level where strategic priorities lead to the appraisal of individual projects, the collection of data on project achievements and an evaluation of impact of the individual projects. The inner cycle describes the project itself, starting with the theory of change and underlying assumptions which lead to the specification of the project including the choice of activities and inputs. Once implementation starts, gross and net outputs are monitored and recorded and, if sufficient resources are devoted to this activity, a project-based evaluation is undertaken. The results provide learning both for the individual project as well as for the programme as a whole. Once an evaluation circle has been completed, knowledge acquired during project implementation and the evaluation process can be brought to bear for subsequent programme and project developments.

Different evaluation approaches

DG Regional and Urban Policy distinguishes between two different approaches:

- The *"theory-based" impact approach* which follows each step of the intervention logic and focuses on the mechanisms leading to the observed change. This is particularly appropriate for answering questions such as "why", "how" and "in what context" an intervention works
- The *"counterfactual" impact* approach includes the use of control or comparison groups and is particularly useful in answering "how much" of the change is due to the intervention and comparing the effects of different instruments (or the same instrument applied to different target groups).

[34] Reference 21

The two approaches are complementary and the most useful impact evaluations draw on a mix of methods: counterfactual methods can help quantitatively to estimate impact; theory-based methods help to understand the underlying mechanisms and the context of an intervention, thus helping to apply it to other contexts. [35]

Moreover, there are different motivations for evaluations. The first is known as *formative or process* evaluations. Those supporting initiatives may want to know how well the project they are sponsoring is doing and whether it is on track to achieve its objectives. Such formative or process evaluations are often commissioned at the mid-way or interim stage of a development.

The second type of evaluation is often called a *summative* evaluation. It explores how the initiative has impacted on its environment in a longer term perspective. Such evaluations are designed to enable sponsors (often in the public sector) to decide whether their support has been worthwhile and whether they should consider similar projects as worthy of support in future.

Any impact measure needs to reflect the objectives of the scheme that is being evaluated. For example, a science park evaluation measuring the impact on employment in general – or knowledge-based employment in particular – assumes that the science park which is the focus of the evaluation was aiming directly or indirectly to increase knowledge-based employment.

Performance indicators and monitoring

While there is some overlap between performance measurement and evaluation, there is also a major difference. Performance measures or indicators are an internal management tool reflecting key milestones and targets of a project. Once these indicators have been set, regular monitoring of progress against targets will provide the management team and its sponsors with information on problem areas and the need to reallocate effort in order to address any shortfalls.

While each scheme is different in its focus and configuration, the following are amongst the most common indicators:

- Particularly in the early years of a science park, area of land developed (in hectares) and building space constructed (in square metres)
- Number of companies located at the park and the number of people they employ; additional information may relate to the type of employment created and the number of qualified scientists and engineers employed
- Number of companies that have graduated from the park and their employment numbers
- Rental and services income per month, per year and over time
- Type and range of common services provided by the park (such as broadband telephony, video-conferencing, meeting rooms, secretarial support, networking events, virtual accommodation address facilities and many more). Some of these services will be provided free of additional charge, as part of the rental deal, while others will be charged for separately
- Type and range of professional services provided either directly (by the park management itself) or indirectly (by others encouraged by the park management to offer these services). Such services include book-keeping and accountancy, mentoring, access to risk finance, marketing

[35] See ibid

support, public relations support, general business advice, technology transfer facilitation and networking with the knowledge base. Again, some of these services will be provided free of additional charge, sponsored by others or as part of the rental deal, while others will be charged for

- Funding for capital and operational purposes raised and spent
- Inward investment projects attracted to the region by the science park itself and/or in cooperation with others such as inward investment attraction bodies or regional development agencies.

For science parks, key performance measures will reflect the reasons why key sponsors became engaged in the first instance. Some sponsors provide extra funding for the science park to undertake activities over and above their initial remit, complementing the scheme's wider economic development role.

Ideally, performance measurement should be undertaken on the basis of a simple performance management and monitoring system set up early in the lifetime of the park and built upon as additional functions are added. Such systems can be simple to manage but they do require a certain discipline to populate the data sets regularly. It is surprising how often there is no proper monitoring in place and this omission makes the tracking of progress difficult. Sponsors should encourage the design and implementation of monitoring systems right from the start of any science park initiative.

The difference between performance reporting and evaluation

While they have similar building blocks, there is a difference between regular collecting and reporting on performance indicators and evaluation.

Monitoring provides information on progress and achievements against targets. It is basically a management tool for the science park team and its sponsors and is often used for internal purposes only. Evaluations revisit the 'theory of change' and seek answers to questions on the extent to which the science park has addressed its original rationale and the change it has brought about.

Evaluations cannot be undertaken on the basis of records held by the science park team alone. They require external evidence and views provided and expressed by others, most importantly businesses associated – or previously associated – with the science park.

Only businesses themselves know the impacts a location on the science park has had for them in terms of *additional* innovation, value-added and/or knowledge-based employment and any other positive effects. To assess these impacts requires a survey of a significant number of beneficiary businesses associated with the park on the basis of a standardised questionnaire administered (depending on available resources) through face-to-face interviews, telephone conversations or postal/web-based surveys.

In order to be meaningful, such surveys need to probe the extent to which any positive changes which the company has experienced can be attributed to being located on the science park and are therefore *additional* to what would have happened otherwise. *Additionality,* also referred to as *deadweight*, is change that would have occurred even without the intervention. The majority of STP clients tend to be existing businesses relocating from within the locality or region. Transferred jobs

cannot be counted as new/additional jobs automatically; only those jobs which are being created by the relocating company due to the enhanced conditions on the park are truly additional.

Without such an assessment of *additionality* it is impossible to attribute the impact of the science park to company performance. Given the complexity of the concept, some broad assessment bands can be used as a proxy measure including: 'totally additional' (without the science park the company would not have achieved any of the impacts), 'somewhat additional' (the company would have achieved some of the impacts but not all of them) and 'not additional at all' (the science park had a negligible impact on the development of the company).

A full assessment of *additionality* would benefit from a representative survey of businesses not located on the science park to assess whether the self-assessment of science park companies is likely to reflect reality. However desirable such control group assessments are for methodological soundness, they are, however, very difficult to conduct for a number of reasons. These include:

- Finding a representative sample of control group companies is complex; the control group would have to consist of a similar mix of knowledge-based businesses as those on the science park and identifying those is difficult due to the fact that science park companies tend to pursue innovative and often idiosyncratic products and services
- Persuading control group companies to take part in a survey which has no direct benefits for them is also difficult and leads to low response rates for control group surveys which in many ways invalidates the information that can be gathered from them.

Evaluations also need to address the issue of '*displacement*'. The success of the science park and its tenants may be counterbalanced to a degree by reductions in success by other businesses. Displacement tends to be particularly high for companies that do most of their business in the local market whereby their own success often reduces turnover of others. Displacement effects by science park companies tends to be relatively low because they tend to trade in national – indeed often international markets – and therefore do not reduce the fortunes of companies in the science park catchment area. There may also be displacement effects on other providers of property schemes where science park companies used to be located. Given the fact that most science park companies relocate from elsewhere in the local economy, these displacement effects can be significant for a small number of property businesses.

Over and above surveying science park businesses, evaluations also need to collect the views of partners, sponsors and wider stakeholders of the science park to unpack any other impacts on the regional knowledge economy as envisaged in the 'theory of change'. For instance:

- Regional development agencies and inward investment attraction bodies will provide feedback on the extent to which the science park has helped to attract knowledge-based inward investment projects. Such impact is not equally distributed across European regions. Figure 1.4 shows that multinational presence on STPs is only more than 10% of occupiers in about 28% of EU STPs. Those STPs that are successful in attracting foreign direct investment projects may have greater market presence and better local economies while others struggle to overcome deficiencies in the underlying environment. In any case, local/regional stakeholders will be best placed to assess the impact of their park on foreign investment attraction

- Universities and other knowledge-based institutions will provide views on the strength of linkages between the park, its businesses and research and development bodies
- Business associations and chambers of commerce will comment on the strength of the innovation environment including the ease of taking risks and getting rewards and the characteristics of the labour market
- National government representatives will have views on progress of the regional knowledge economy surrounding the science park compared with other regional economies.

Is it possible to prove the impact of science parks from aggregate data sources?

The question arises whether it might be possible to prove whether a science park has a positive effect on its knowledge economy by analysing aggregate data at the EU NUTS 2 level. The types of STP outputs that might be measured and compared to NUTS 2 regional statistics and the relative difficulty in securing them are:

- Employment gains from STP supported companies
- Turnover gains (per capita) from STP supported companies compared with overall NUTS 2 GVA per capita
- Innovation input measures[36] such as:
    - Researchers as a proportion of total employment
    - Employment in High Tech sectors
    - Patent applications.

Employment gains attributable to STPs

Total employment on an STP is generally the most straightforward output measure to obtain but not all employment on an STP is necessarily created at the park. As discussed earlier in this chapter, companies moving to the park from elsewhere in the region typically account for 50-70% of resident companies, giving rise to 'deadweight'; thus, only the increase in employment should be counted and an assessment needs to be made how much of the subsequent growth might have happened and how much can be attributed to the science park location with its growth-oriented services and facilities.

Since few STPs routinely keep any records of the arrival employment level, employment gains are notoriously hard to measure accurately. Where STPs have public funded projects, then some relevant statistics are more likely to be available but they are likely to be confined to the time and extent of the project. Similarly the employment gains attributable to STP services as opposed to 'deadweight' gains are difficult to separate. Conversely, some of the most successful companies will outgrow a park, or will need premises of a nature not suitable for a park (e.g. manufacturing space) and equally these gains are seldom captured and they can be very significant.

Experience suggests that as time progresses an increasing proportion of employment on a park can be attributed to growth rather than arrival employment but this does not overcome the

[36] There are no innovation output measures documented at the NUTS 2 level which may actually be more meaningful and easier to measure.

'deadweight' argument. Overall, for a young park less than ten years old a count of on-site employment is likely to overstate the employment attributable to the benefits of the infrastructure, and support provided by a park. However, for parks more than 20 years old the converse may be true if there are several companies that have been set on a high growth trajectory by being at the park then moving outside the park or merging with other companies.

Research by Storey et al[37] showed that over a 6 – 7 year period about 20% of UK STP companies merged with or were acquired by other companies. The experience of the author is that it is either the most successful independent companies or the weakest that are absorbed by a merger or takeover. Since approximately 70% of employment gains on an STP tends to come from as few as 3% to 5% of the companies[38] and these successful companies are the most likely to become engaged in a sale or merger, the problems of identifying the real employment growth stimulated by an STP are complicated to say the least.

Case Example

A quick factual case to illustrate the above points: CAS (an analytical geo-chemistry company) started on an STP with 1 employed person. It grew on the STP over 5 years to about 15 people and received multiple levels of support over that period. To continue its growth it then needed a more industrial type of premises so relocated off the park to a local industrial estate. In the next 5 years, it grew to 75 employees and was taken over by a large water utility company. CAS remained as a recognisable division of this company for the next 7 years and grew to 180 employees when the CAS team became fully integrated with the water company. According to the original founder of CAS, approximately 350 jobs are now related to the activities of the original CAS. A high proportion of the jobs require qualified scientists and engineers. The founder attests that but for the STP it is probable that the company would never have been started. So what is the employment count that an STP should record today for CAS - 0,14 or 349 jobs? (Zero is an option because CAS is no longer on the park and no longer exists as a legal entity).

Thus, the first step should be to decide what the employment count rules should be. Inevitably it will start with the current employment levels. The real decisions are:

- Whether to try and capture arrival employment and post-departure employment both of which will considerably complicate and extend any data capture exercise; and,
- How to manipulate the data collected to best reflect leakage, displacement, deadweight and possible multipliers.

STP company turnover gains as a contribution to regional GVA

Turnover is not the same as GVA unless purchased inputs from other companies are deducted. A vanishingly small proportion of companies will ever disclose enough detailed information to allow their contribution to GVA to be measured accurately unless the data are required for statutory reasons. Furthermore, many companies are reluctant to disclose even their turnover figures to researchers. However, a reasonable proportion (25 – 35%) can be persuaded to place their turnover in one of six or seven turnover bands. Careful use of statistical techniques can manipulate these data to give a reasonable approximation of the aggregated turnover of a population of businesses.

In the case of sectors such as ICT, bio-medical technologies and technical services the value of bought in business goods and services is usually a modest or small proportion of turnover and since

[37] An assessment of Firms Located on and off Science Parks in the UK, Storey et al, 1994, HMSO (ref 22)
[38] Ibid

these sectors account for a substantial component of the businesses on most STPs, turnover is a reasonable first approximation as the contribution to GVA. Just as for employment all the arguments about leakage, deadweight and displacement apply.

Innovation Input Measures

The Europa NUTS 2 statistics do not capture any measures of innovation **output** such as the number of new products or services that a company introduces to the market in a given year or period and the estimated percentage contribution to the company's turnover arising from the sales of those new products and services. These data are usually amongst the easier to capture at company level but since there are no regionally based statistics to compare with, no inferences on the regional impact of STP companies in the region can be made.

There are five NUTS 2 innovation input measures. Their descriptions and the issues raised in collecting the data and calculating them are:

- R&D intensity – R&D as a percentage of Gross Domestic Product (GDP)[39]. If turnover is captured as described above and appropriately manipulated to provide a pseudo STP level GDP then provided R&D expenditure is captured a measure of R&D intensity could be derived. However capturing R&D&I data, particularly from SMEs, tends to be difficult and unreliable although some companies are prepared to estimate R&D as a percentage of turnover within percentage ranges (0; 0-5%; 6 – 10%; 11 – 20% etc.) However, given that the amount of statistical manipulation required for both numerator and denominator will be substantial in calculating R&D intensity it is doubtful that the result will be particularly meaningful. Given that this is only an input measure it is advised that this ratio is not considered further at the park level.
- The proportion of researchers as a percentage of the total employed. This information can be gathered but response rates are usually low unless banding is offered.
- Human Resources in Science and Technology Core (% of active population). For most STPs this measure is likely to be small compared to the totals at regional universities and other research and educational organisations.
- Employment in high tech sectors as a percentage of total employment. This is probably the most significant indicator to try and secure data to calculate. By definition, at STP level, the number should approximate to 100% of employment. More importantly given that this ratio is calculated for NUTS 2 regions multiplying this ratio by the overall NUTS 2 regional employment figure will provide an absolute number which can be compared to the total employment at an STP.

Case Example

Case Example: The UK West Midlands region (comprised of three NUTS 2 areas) has a figure of 173,000 people employed in the high tech sectors. There are seven STPs in this region with an estimated total of at least 5,000 employees which would represent nearly 3% of the region's total high tech sector. In the bio-med, environment technologies and certain parts of the ICT sectors historical regional studies have shown that the region's STPs are a base for a substantially higher proportion of the regional capacity in such sectors; 20% or more in some cases.

[39] Gross Domestic Product (GDP) and Gross Value Added (GVA) differ in the treatment of taxes and subsidies.

This gives the best clue we have as to how STPs are delivering impact – it is in the emerging areas of certain technologies. The technology areas where they will be making their contribution may differ from STP to STP and from region to region. The employment in the high tech sector is therefore perhaps the most important single starting number for beginning to understand STP regional impact. But it is only a start; more in-depth analysis on the technology strengths of an STP are required to show whether or not the STP companies in specific technology areas are a significant contribution to developing or strengthening specific emerging regional "clusters". There are no NUTS 2 statistics to work with at this level – but if as hypothesised it is the mechanism by which STPs are adding value, then not to explore this could lead to condemning STPs for not having sufficient economic impact simply because the wrong aggregate measurements are being made. Interestingly this also gives an analytical approach for deciding the how STPs might contribute to a regional SMART Specialisation Strategy.

- Patent applications per million inhabitants and ICT patent applications per million inhabitants. In the bio-med / life sciences areas patents tend to be particularly important to the funding of the early stage development of these businesses – thus there is a high motivation to patent. The same is true of engineered products and novel electronic hardware. But in other areas where STP companies are well represented that involves the interplay between the creative industry sectors and ICT (notably digital media, internet, web and mobile technologies) where new products and services are proliferating, patent activity is low amongst SMEs. The speed of change simply makes patents irrelevant in the minds of many SME business owners operating in these sectors. Instead they tend to rely on secrecy, encryption and constant updating of their technology to keep up with the market. Since these business activities tend to be well represented on a high proportion of STPs, patent data might be lower than expected. Nevertheless it should be one of the more accurate pieces of data to gather.

Summary and conclusions

Evaluations are essential tools to understand the impact of individual science parks. While anecdotal evidence and expressed opinions may help to shape views whether a science park is successful and whether it plays an important role in its local/regional environment, collecting such evidence and views can only ever be the first stage.

In order to assess impact it is important systematically to revisit the scheme's objectives and interrogate managers, wider stakeholders and the beneficiaries of science parks (foremost the tenant and client companies associated with the scheme) about the impacts and achievements they have experienced.

Evaluations are facilitated by having good monitoring data on key performance measures. These will differ from scheme to scheme but can be expected to have a core of common data.

In undertaking science park evaluations, it is important to take into account that science parks are not the only players in the knowledge economy. They operate in an environment which, although they may want to influence it, also constrains them in what they can achieve. Factors such as the business start-up rate, entrepreneurial spirit, the availability of risk finance, infrastructure, labour markets and many more at any given time are what they are and the science park needs to make the best of its environment.

Indeed, science parks can play a strong and pro-active role in facilitating an improvement in the characteristics of their knowledge economy and for that to happen cooperation between actors is seen as the primary route to more and better innovation. Competition arises primarily between actors in the same category (eg venture capitalists, universities, STPs etc) where they are not differentiated through specialisation in the services they offer into the innovation ecosystem.

5 How to operate and improve an STP

Once a science park has been established and is beginning to mature, there is a permanent need to ensure it is continuing to meet its objectives and is achieving its potential. The findings from ongoing monitoring and regular evaluation activities will be an important input to the management team in making sure the science park works as well as possible. In aiming to improve the science park, the management team will also try to consult with wider partners and stakeholders to allow all to play their optimal role in the park.

The key success features identified by the work on third generation science parks previously referred to in this report provides a framework for on-going quality assessment and improvement and the key dimensions are discussed in the next sections of this chapter. [40]

National, regional and local context

A successful science park is – and cannot be – a stand-alone venture. All science parks are influenced by their environment and shaped by the implementation of local, regional, national and international innovation policies.

One of the key influences is the state of regional and national economies and the health of the global economy. The recent economic crisis – whose reverberations are still strongly noticeable across the globe – has had a strong influence on science parks as well as all other economic players in the public and private sphere. Technology-based firms have suffered through loss of markets and market growth which in turn has meant that science parks themselves have had to cope with difficult times. However, there are indications that science parks have coped better with the recession than more general property schemes because of the fact that they often provide a home to niche companies which have competitive advantages that often help to cushion the worst economic blows. The IASP 2013 STP statistics show that at the worst point of the recent recession, EU STPs average occupation level fell from 79% to 73% ie approximately 7.5%. However this loss was not uniform. Figure 5.1 shows that while 61% of parks suffered less than a 10% loss of occupancy, there were about 8% of STPs that experienced an occupancy loss of more than 40%. Typically, it was the smaller and medium STPs with less than 50,000 m^2 of developed buildings that tended to suffer the higher losses in percentage occupancy - on average two or three times greater than losses incurred by larger STPs.

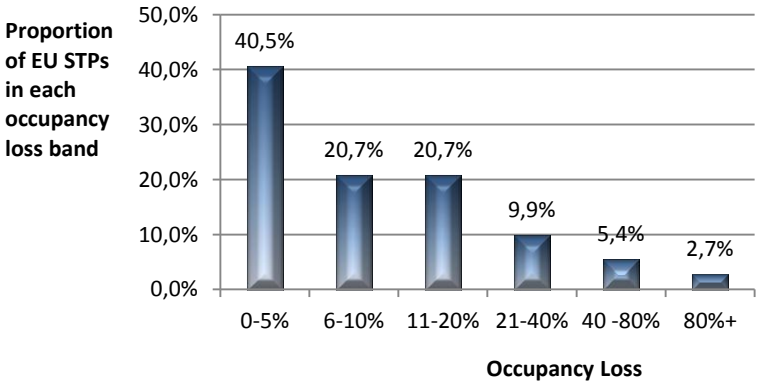
The importance of the strategic context within which science parks operate is demonstrated by the case studies. Interestingly, however, most important for all of them is the support they have received/are receiving at the local level. When it comes to national and regional support, a mixed picture emerges with some rating this support as very important, some as moderately important and some as only slightly important. An equally mixed picture emerges with respect to associated universities and banks. Agreement on the high importance is almost unanimous when it comes to support from the European Union. Thus, the case study 'good practice' parks present a picture of

[40] Professor John Allen: Third Generation Science Parks. Manchester 2006. (ref 8)

local and European support, sometimes in combination, as being particularly important in the development of EU STPs.

Some national governments have been aware of the importance of supporting the knowledge economy and innovation in times of crisis and have provided framework conditions that have helped the parks themselves as well as the companies located on it. Some science parks and national and international science park associations have played an important role in raising the profile of the knowledge economy and making their governments aware of the need to support companies and science park initiatives.

Figure 5.1 Loss of Occupancy in EU STPs caused by the 2007/09 recession



For European parks, this includes policies and initiatives for innovation and enterprise support designed and implemented at the European level. For the next programming period 2014 – 2020, smart specialisation strategies designed to help countries build on their specific economic advantages are particularly relevant.

Science parks need continuously to scan their environment to understand whether their product and service offer addresses the needs of their regional economies and their tenant companies or whether they need to adjust and change their offer.

Strategic policy and management

In order to be successful, a 21st century science park has to have both strategic and day-to-day management of the highest quality.

In terms of *strategic management*, this means that a long term strategy has been defined and is being implemented under a sustainable business model. This is never a small undertaking because science parks are innovation hubs, involved with places, processes, relationships and outcomes which all have to be managed for the benefit of the park. Strategic management in this sense means effective networking amongst key stakeholders and partners at the level of senior decision-makers. In some instances, representatives of the key organisations will be on the board or advisory committee while in others such networking has to be undertaken through less formal channels. Given the need for sustainability, it also means that sources of income and funding over and beyond

those generated from the park's property functions and tenant fees have to be identified and accessed.

In terms of *operational management*, successful parks employ top quality chief executives, with demonstrable leadership qualities, a broad set of skills and the capability to relate positively to the wide range of organisations which regularly interact with the park. The underlying fundamental objective in managing a mature park can be summarised as 'optimising serendipity'.

Science park management consists of a wide range of functions including:

- Overall direction and management
- Implementation of agreed strategies
- Project and programme management
- Property development
- Finance and accounting
- Technology transfer
- Marketing and promotion
- Animation and linkages
- Facilities management
- Landlord functions.

In addition, good science park managers require broad sector experience (public, university, industry, enterprise). Industry / business experience is essential for credibility with the STP clients while university / research experience coupled with industry experience is invaluable for technology transfer credibility with university partners. Hard won enterprise experience through starting a company or managing an SME will ensure that entrepreneurs will listen and learn. A period of time in the public sector is necessary to understand planning, funding sources and concepts of public accounting, budgeting and value for money which are often far removed from the way in which the private sector operates. The high skill levels required mean that the team has to be remunerated accordingly. It also means that the senior posts are not well suited to long service civil servants, which is a common starting point in some EU countries. High quality public employees may well be able to acquire the necessary skills over 5 - 10 years but this will have an impact on the results achieved by an STP in this earlier period.

It is unlikely that any one individual will combine all of the required skills and therefore operational management tends to be a team effort. However, most science parks have a dedicated single manager who coordinates and facilitates all required tasks and functions. It is difficult to be too specific about the profile of a good science park manager. The mixture will vary from person to person and there needs to be some degree of freedom on the mixture of characteristics:

- 'project manager' – to get things done according to schedule
- 'entrepreneur' – to have commercial instincts and understanding
- 'challenging' – to understand when the culture of the academic partner and other stakeholders needs to change without being threatening or destructive

- ‘marketer’ as the champion and personal face of the park. Firms decide to locate on a science park because they feel welcome by a director and staff who understand the needs of technology- based businesses.

Science parks and their boards and advisory committees need to review their park’s management practices and results regularly to be confident the park achieves its potential.

Finance

The 21st century science park needs to be a sustainable business. This means that the park generates enough income from its property and service delivery to ensure at least long term survival and at best a healthy rate of return on invested capital. Being a sustainable business also entails encouragement of private sector investors to get involved in supporting the development of new assets such as multi-occupancy or free-standing buildings, see chapter 6 for a more detailed analysis.

The proportion of private sector investment in science parks is increasing steadily[41] and investors are beginning to understand that science parks can offer opportunities for significant commercial returns. STPs can also increase the amount of private bank borrowings they can secure by ensuring that they plan and build to appropriate standards and in conformity with good real estate management practice. This should ensure that the commercial value of their fully occupied premises exceed the development costs. Then as rents rise the asset value of the STP’s properties will also tend to rise providing additional security that can be offered to a bank for new borrowing.

However, the role of public sector investment remains crucial, particularly in the early stages of development when the concept needs proving within its local environment. Moreover, areas with special difficulties due to their industrial history may always require the public sector to intervene to overcome what may be perceived as above average risks by private investors.

STPs also have a responsibility to understand the different types of finance that their tenants and other clients need to survive and grow. Regular feedback from client companies and an assiduous approach by the management of STPs to understand the market finance offerings from R&D grants to business angel and seed funds and from invoice discounting to loans is a critical task. It is only by understanding the gaps between the finance needed by their company clients and the market offerings that the STP, either alone or with partners, can set about securing the resources to create funds to close those gaps.

Physical environment

The importance of intelligent design that maximises the chances for innovation and ‘serendipity’ is becoming increasingly recognised by science park professionals. Science parks started out as predominantly physical developments in the early 1960s; they developed by adding a range of ‘softer’ services and animation activities. “The 21st century science park once again regards the built environment as vital, not as an end in itself but as an aid to the process of creativity, interaction and innovation.”[42] Physical developments need to take into account the requirement for flexible

[41] While statistical evidence is limited anecdotal evidence is high eg the acquisition of six STP sites by LaSalle Investment Management across the UK www.bestnetwork.com

[42] Professor John Allen: Third Generation Science Parks. Manchester 2006 (ref 8)

working, open innovation and creativity and allow for the use of leading edge information and communications technology. Such design can become a significant success factor for the park. It provides the physical manifestation of the ethos and values of the park and can become a symbol of what it stands for. Good design creates an environment conducive to working which helps to attract inward investors and in turn makes it easier for them to attract key staff.

It is particularly important that the park centre or hub buildings as described in chapter 3 are designed for collaboration and wide usage by both park companies and similar innovation-led businesses from other parts of the locality.

Some parks also experiment with the boundaries between the park itself and educational and residential areas to ensure that the flexible boundaries between working, learning and living find their reflection in the physical design of the park.

For older parks, there are specialists who help to re-engineer increasingly outdated and obsolescent buildings into effective, energy-efficient and good looking buildings and workplaces. [43] Such re-engineering can have many benefits including:

- Costs are less than for new buildings – between a third and two thirds
- Buildings can remain occupied or semi-occupied during the project, holding on to valuable tenants and income streams
- Re-engineering is the sustainable option in the UK where we already have a lot of buildings
- The environmental impact is less than new build
- It is a more flexible option in terms of cost – from minor interior refurbishment to major re modelling
- Re-engineering can deliver not only an end product as good as a new one but often more exciting and imaginative.

Relationships with the knowledge base partner

As discussed earlier in this report, an intensive relationship with the knowledge base partner, often one or more universities, is the key feature that distinguishes a science park from an ordinary property development. In some cases the university is the founding - or one of the sponsoring - partners of the park. In other cases the academic partner needs to be brought in to play its full role.

There are many ways in which a close relationship with the University benefits the science park and, when it works well, the relationship is far from one-sided; benefits flow from the park back to the university in many tangible and intangible ways. For example, science parks can play a role in shaping university curricula, encourage exploitation and be a focus of enterprise education.

The importance of close collaboration with the knowledge base is demonstrated by the case studies. In all but one of the case study projects, the science park is involved in university committees.

[43] See for David Leon in the United Kingdom (www.davidleon.eu)

Despite these mutual benefits, there are often barriers - or even tensions - between the academic partner and the science park. These problems can have many origins. The most common ones include:

- Differences in ambitions and incentives; while academics undertake research in order to progress knowledge and publish results, science parks and their companies are aiming to commercialise and make profits which may require patenting results to ensure exclusivity.
- Differences in timescales; academics are used to work in long cycles, often more than five years and sometimes over a whole life time. Science park companies need to commercialise products and services quickly in order to survive, pay their employees and service loans and equity capital. There is often frustration on either part about the differing expectations and necessities.

In order to address any tensions, it will be important continuously to inform and educate what the park is all about, how it can help the university and vice versa what benefits to the park and its companies stem from the close relationship with a high quality research-based organisation.

There is also a need for clarity on the rules governing the use and ownership of intellectual property. This will be helped by a strong working relationship between the park management team and those in charge of research commercialisation at the associated knowledge base organisation. Clarity and overlapping objectives will be essential to achieve satisfactory results for both parties.

There should be regular communication between the science park management team and representatives of the knowledge base partner to explore whether linkages are working as effectively as possible.

Networking

Effective networking is imperative for the park management as well as for the companies on the park.

Science park *managers* must network effectively to raise the profile of their park, ensure effective marketing and mobilise ongoing support and sponsorship opportunities. Such networking needs to be done locally and regionally with key sponsors and stakeholders but it is also essential to engage in national and international networking to encourage international investment and linkages.

The importance of regional networking is demonstrated by all case study parks all of which have excellent connectivity into their regional structures and committees. The case study parks are also noticeably more active in signposting and networking with external professionals and they are amongst the most active in supporting clients outside their park as well as within it.

Effective networking is equally important for science park *companies* who rely on good contacts in order to sell their products and services and develop effective supply chain relationships. Knowledge-based companies often offer specialist and niche products which require extensive market reach and rely on national and international marketing success.

There are many good networking practices including:

- Use of the park as a meeting space; science parks tend to have a range of smaller and larger meeting spaces and those parks associated with a knowledge base organisation often have access to conference facilities. Encouraging frequent use of these facilities by outside organisations brings a wide range of organisations in touch with the science park and helps to raise awareness
- Best use of alumni from the knowledge base institution as well as the science park and its companies. Those who have been previously associated with the park and its associated institutions know it well and can act as ambassadors of the scheme once they move to other locations nationally or internationally. There are many ways by which the opinion and activities of alumni can be supported, for example though regular updates or exchange visits
- Regular use of printed, electronic and social media updates to report on recent developments keep the park in the public eye
- Membership in national and international associations bringing together science parks, technology transfer and enterprise support professionals are helpful for learning and marketing
- Participation in regional, national and international business and innovation support programmes also serve the purposes of learning and networking.

Networking is equally important for the *tenant companies* themselves who need to keep abreast of a wide range of sales, partnership and supply chain opportunities. Companies tend to know themselves how to scan the environment for relevant contacts. However an STP with a good reputation will attract a wide range of professional service, financial and investor organisations that a good STP management can introduce to their client companies as appropriate opportunities arise or through the regular network meetings and events organised by the park. These meetings can also promote business to business networking between science park companies themselves and similar external companies that can lead to new strategic alliances or simply supplier customer relationships.

Growing the tenant company

Ideally, in a science park the tenant relationship should be a very close one and the park team should add value by interpreting the opportunities arising from the business of each of their tenants.

The way by which support is offered varies between parks. Some parks offer a range of support and advisory services themselves while others facilitate access to support services without getting engaged in it directly. Either approach has its pros and cons; the essential point is that the support is available for companies to benefit from and that it is easy and straightforward for them to identify and access it.

The importance of spending on business and innovation support is demonstrated by the survey. Looking at the full survey data, some 40% of parks spent relatively little (less than € 1 million) over the programming period. By contrast, all case study parks are in the top 40% of revenue support activities with five in the top 30% and four in the top 17% of business and innovation support spending.

The areas where companies may require support include:

- *Links with the knowledge base partner*. It is one of the key functions of science parks smoothly to facilitate linkages with their associated knowledge base partner. There are many ways by which these links can be created including one-to-one 'matchmaking' and regular events. This area is one of core importance to the park to be handled in-house rather than being contracted out
- *General and specific business support*. While science parks can be expected to act as the first line of contact regarding business support needs, there can be merit in having a network of independent professional advisors associated with the park. Possible areas where support may be required include business planning, marketing, globalisation, quality improvement & control, and human resources. There may be support schemes by which this advice, at least in the early stages, can be provided on a subsidised basis
- Support with *commercialisation, intellectual property and patenting*. This advice tends to be very specialised and will best be accessed through associated experts
- *Access to finance, seed and venture capital*. Some science parks have their own dedicated risk capital funds while others provide links with possible funders. Investors tend to respond positively to companies located on science parks because they know that the chances of survival and growth are higher in a supportive environment than elsewhere. Science parks themselves can help to raise the profile of their companies and facilitating funding by organising regular elevator pitches and introducing financial intermediaries to science park companies.

Business Support Example 1

The University of Twente in conjunction with BTC Twente (an STP) developed the TOP programme for starting new innovation-led businesses based on staff, students and alumni of the university. Later the programme also admitted local entrepreneurs. Each candidate had to pass a selection interview and those who were successful received a package of resources over the course of a year which included: a working place to operate from, a business mentor to guide business planning and strategy, an academic mentor to help with technical problems, a €15,000 interest free loan and entrepreneur training. By the end of the year most programme participants had formed a new business and started to trade. The programme was funded through ESF. This programme was promoted as best practice by the EC under the brand "Unispin" and was taken up by many universities and STPs across the EU who also funded their projects via ERDF or ESF resources

The best way for science park managers to understand whether they are providing enough and the right quality of support is for them regularly to canvass opinions amongst their tenant companies and amongst external clients that they supply services to.

Business Support Example 2

Zernike Science Park developed a novel low cost programme to assist SMEs on their park to access markets beyond the Netherlands within the EU. Zernike recruited two professional marketing people and through the EU Leonardo programme brought economics and business studies students from other EU counties for periods of 3 – 9 months into the Zernike marketing team. The students worked under the supervision of the professional marketing staff on market research, partner finding and market intelligence activities for Zernike's clients. Students were provided with assignments where the target market was in their mother tongue country, thereby keeping costs low and overcoming language and cultural barriers. This programme was licensed by Zernike to several other STPs across Europe.

Processes to improve science park performance

There are many ways for science parks to improve their performance. As a starting point, the following questions need to be addressed:

- Has the park objectively analysed itself in the context of the local innovation ecosystem?
- Are there barriers within the STP partners inhibiting the park's executive from undertaking certain types of activity that they see as their prerogative
- Is the top level executive officer capable of understanding what else might be undertaken to improve the local innovation ecosystem, secure the necessary resources to bring about new services or better focus existing services and implement those services?
- Do the partners and the executive fully understand the business needs of the modern knowledge based businesses and the specialist forms of support that are needed to help companies to innovate more successfully and to foster the emergence and early growth of new businesses in these sectors. What is required in the life sciences fields can be quite different to that needed in digital media and internet technologies which is different again to the environmental and sustainability technologies?
- Does the STP have a structure that allows for function improvements? (This can be difficult where one partner owns the land and some of the buildings, other partners own other buildings, the university have no ownership stake in the STP and see itself as the sole technology transfer and knowledge base organisation and the remit of the STP management is constrained to maximising rental returns)?

In setting out to improve its function the park executive and stakeholders need to recognise that in its approach to service an STP should be clearly differentiated from the university by working from the perspective that the interest and needs of its business clients comes first and then working with the university and other actors to create the types of innovation services that are most likely to lead to successful innovation producing good commercial outcomes. The parties can then move on to establish what activities the STP is best equipped to perform and others better suited to the university or other parties, where those activities should take place – on the STP or in the university campus and how the parties can collaborate in delivery to companies and whether or not to involve other organisations.

Following on from this framework, a more comprehensive approach to quality assessment and improvement would be an accreditation and continuous professional development model.

STP Associations in Europe

At least sixteen EU member states have an STP association (or an association that includes STPs as a member category) and the International Association of Science Parks and Areas of Innovation (IASP) has a pan-Europe presence through its European Division. In addition to newsletters, lobbying and sometimes research, most of these organisations operate meeting programmes that help to keep members informed of important issues related to the operation of STPs including:

- Science, technology and innovation
- Business start-up and incubation
- Inward investment issues

- Government and EU funding programmes
- Trends in the development of STPs, and
- Operational good practice across all aspects of the property and other dimensions of STPs.

These are not professional body accredited education and training programmes, but they are a form of continuing professional development (CPD).

At the pure educational level, IASP has been active in stimulating Master degree programmes in STP management. The first programme was established at the University of Malaga with significant input from the Technology Park of Andalusia as well as IASP guidance on the syllabus. It is a full accredited on-line distance learning course.

Where member STPs and individuals make regular use of Association programmes there is no doubt that it helps them to acquire good practice, take up of new ideas and generally improve the quality of their management.

Accreditation

So far no STP Association operating in Europe has established an accreditation standard for full science parks. The European Business and Innovation Centre Network (EBN) whose members are mainly business innovation centres (BICs) operate an accreditation system for their full members. They award the accreditation of Euro BIC to those members whose processes and operations conform to the Euro BIC standard. Once awarded, members have to supply extensive performance data annually and submit to audits of their activities every three years or as EBN may require. While this standard covers several of the activities undertaken by STPs it tends to concentrate on the processes of new business formation and early stage development. This means that less emphasis is given to matters such as:

- The development of technology clusters
- Technology transfer from the knowledge base
- Inward investment of international businesses
- Larger company innovation as well as SME innovation
- Overcoming barriers to technology business growth beyond the incubation stage through an adequate supply of property of increasingly larger size, on flexible terms, as well business and innovation support.

Therefore, while it might be attractive to promote the idea of extending the Euro BIC standard to STPs, in practice, the extent of the changes needed when added to the 'politics' of European STP Associations make it unlikely that this idea would gain traction in the STP market.[44]

At least three of the national STP Associations in Europe have undertaken, or are in the process of undertaking, work that could lead to some form of standard or accreditation. The more promising leads are coming from the Swedish Incubators and Science Parks association (SISP) and the UK Science Park Association (UKSPA). The developments taking place in these cases are as follows:

[44] Strictly an author opinion

The Swedish Model

SISP (Swedish Incubators and Science Parks association) have identified two parallel actions to ensure that the potential of Swedish STPs to become efficient central nodes within Swedish regional and national innovation support systems is fully realised. These actions are:

- To assist managing authorities and policy-makers to better comprehend how STPs can better contribute to attracting new investment to regions and supporting regional economic growth objectives, and
- To assist their member STPs to work both effectively and efficiently in the wider roles proposed

To this end, SISP has secured the backing of the Swedish Government Innovation Agency VINNOVA that will support SISP and its members to explore and develop efficiency and effectiveness mechanisms. The program, called Innovation Excellence, aims to spread knowledge and good practice to develop processes, methods and tools that will in turn lead to Swedish STPs becoming influential and integrated regional nodes of the innovation system.

The central concept draws upon the systematic non-prescriptive management approach of the EFQM Excellence Model[45] but adjusted to STP industry specific conditions and challenges as well as the general maturity stage of Swedish STPs.

At the centre of the implementation programme which runs from 2012 to 2014 is a peer review system. STPs join a group of four peers and each in turn is assisted by the other three STPs to appraise its current processes and outputs. Initially the programme was to be piloted with just a few members but most have already joined with the intention of achieving an excellence accreditation from 2014 onwards. This programme is supported by workshops, role model case studies and best practice STP processes that communicate mechanisms by which STPs become an integrated and effective contributor to the local innovation ecosystem.

SISP report that the methodology is:

- Increasing member knowledge and understanding and leading to faster development of cooperation between STPs with other innovation actors.
- Leading to a better collective picture of what a science park is which will in turn serve as a solid ground for an excellence declaration or accreditation.

The UK Model

In 2009 the Board of UKSPA approved a self-evaluation tool for its member Science Parks to use. The evaluation tool covers:

- Contextual information on the local knowledge base, locational factors, economic development and planning environment
- Statistical information on the scale of activities
- Policy and objectives
- Strategy and governance

[45] The **EFQM Excellence Model** is a non-prescriptive framework for organisational management systems, promoted by EFQM (formerly known as the **European Foundation for Quality Management**) and designed for helping organizations in their drive towards being more competitive.

- General services and amenities provided by the science park
- Business support services
- Innovation support processes
- The premises offerings
- Output and outcome information

The tool, known as ASPECT (A Science Park Evaluation and Checking Tool) is free to members and a number of UK parks have made use of it either for assessing their strategy or as a check list on their performance. NB: It is not an evaluation tool in the sense of the formal evaluation processes described in chapter 4 of this report.

In an effort to introduce more rigour into the process and as a possible step towards introducing some form of standard the UKSPA Board decided to develop and implement an independent peer-review version of the process. This involved recasting ASPECT into two sets of documentation one designed for the guidance of subject STPs and a second set for the guidance of selected and highly experienced peer members who would undertake the review. This system is known as ASPIRE (A Science Park Improvement Review Framework) and started an initial trial in 2012 with trained and approved peer reviewers and volunteer member parks. It is anticipated that wider use of the process will be promoted by UKSPA and that those members who are reviewed and as a consequence update or otherwise improve their business processes will receive a formal recognition by the association.

Accreditation – Summary ideas

It is helpful that two of Europe's STP associations have started to move towards accreditation with the central part of their methodology based on peer-review. The Swedish model has the advantage that a relevant national body is supporting the development of their standard with the specific objective of increasing the effectiveness of regional and local innovation ecosystems. However, the evidence suggests that to date the UK supporting documentation is probably more advanced and has a greater level of rigour[46]. However, the pace of development in Sweden appears to be faster and is gaining more traction with members.

Unless there is a national imperative (as in the case of Sweden) or a pan-EU imperative, there is little evidence that STP accreditation standards will be adopted across the EU other than by a piecemeal and leisurely route. And yet, appropriate accreditation would be a good mechanism from the perspective of public sector funders providing them greater confidence that mature STPs that they would like to support, or who are bidding for support, are a fit-for-purpose element of an innovation ecosystem offering value for money in the outputs they can deliver. However, for new and early stage STPs other assessment mechanisms are more appropriate as described in chapter 6.

Any move by the EC that could help to strengthen and formalise EU STP association activities, particularly those that move member STPs to more formal CPD or accreditation standards should help to reduce the risk of STP underperformance or failure and ensure a better integration of STPs with their local innovation ecosystem leading to more and better innovation.

[46] Based on private correspondence and documentation provided to the author. (Ref 23)

6 Public Sector Investment and the STP Lifecycle

This chapter is all about recognising that an STP like any other organisation has stages in its existence where certain types of finance are critical and yet there are other times when they are not. Chapter 2 identified how an STP's economic environment has a profound effect on the performance of STPs as does the ownership and governance structure. Therefore, the primary purpose of this chapter is to explore the role of public sector resourcing of STPs and their success and failure. From this exploration, conclusions are drawn about when public sector financial support is most needed and appropriate and when it is not.

The possible or actual closure of an STP is an emotive topic and in general is a matter for the owners. However, there can be a public sector interest in any closure of an STP where there has been public sector grant or loan funding and the conditions of that funding have not been fulfilled at the point of closure. This chapter will explore some of the ways in which the public sector investment loss can be minimised in the event of closure.

There can be no doubt that public sector support of the STP movement in Europe is important. Approximately 85% of EU STPs have accessed public funding in the last 12 years. In those regions that STPs believe ERDF funding is accessible to them the figure is nearer 89% but even in areas where STPs believe that ERDF funding is not accessible, public sector financial support arises in 68% of STPs[47]. The chapter heading is therefore highly relevant to STP owners and promoters as well as public policy-makers in Europe.

Stages of development and public funding of STPs

In this part of the analysis, the stages of development do not refer to the generation of the STP as described in chapter 2, but rather to the chronological stage ie whether it is in the start-up stage, is going through early stages of the construction programme or is fully operational. Figure 6.1 based on 2013 data[48] indicates a number of important features of the funding of STPs over the last 12 years:

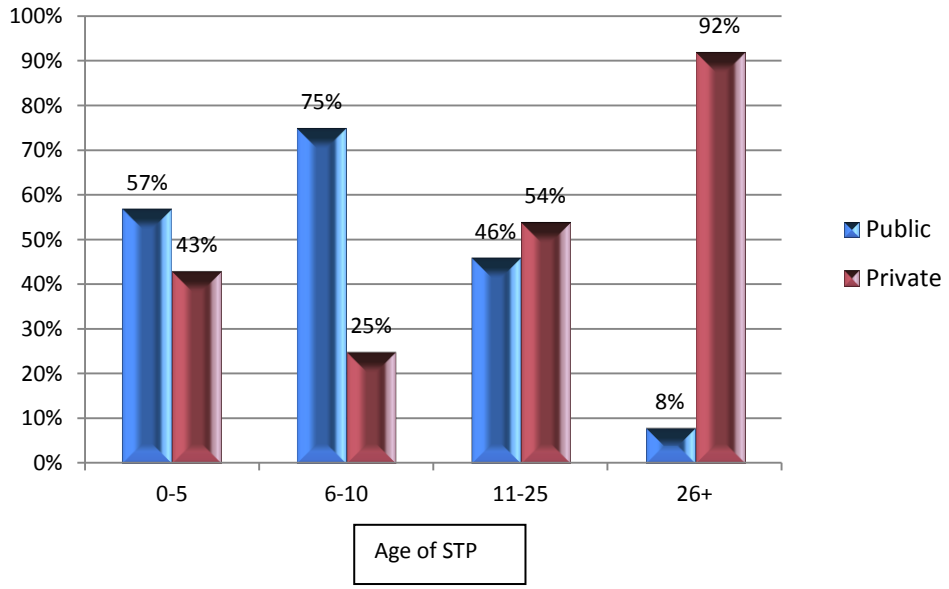
- Public sector funding for the youngest STPs aged 5 years or less has a noticeably higher proportion of private sector funding than for the 6 – 10 year age parks. There are two possible explanations. The first is that the sample size (5) in this category of the population is too small to be statistically significant. Secondly, it is plausible that the private sector which is known to be increasing its interest in STPs is deciding to invest in public-private partnership models in selected, well-located new STPs.
- Public sector funding peaks as a proportion of capital finance for parks of between 6 and 10 years. This is undoubtedly a period of heavy investment when any STP with good management and a strong market and innovation ecosystem can expect to be growing quickly but much of the investment falls into categories which are sub-commercial (eg early speculative grow-on space, specialised technology facilities and some collaboration areas – (see **Table 6.2** below) and so private sector interest may be muted. Therefore, this is a

[47] IASP EU STP Survey, 2013 (ref 3)
[48] ibid

period of relatively high risk for the public sector as investor. Methods of mitigating this risk are discussed later in the chapter.

- In the period from 11 – 25 years, much of the sub-commercial Park Centre or Hub buildings will have been completed (see chapter 3 for a description of these properties), there will be a clear track record and the management team will have sharpened their skills against the market and should be able to move forward with confidence. The capital funding for these parks is close to 50:50 private and public and given a good track record the opportunities for greater levels of private sector funding should be increasing. The risk to public funders will be lower, but equally public organisations could expect that the reach of these STPs into the local and regional market should be increasing steadily and the outputs generated should be starting to have a noticeable impact on specific knowledge-based business sectors in the economy.
- Once STPs have matured to over 25 years private finance starts to dominate further capital investment. Some of this will be coming from private sector commercial property developers or real estate investment organisations. However it is also a time when a successful STP may well have created significant property assets which it can use as collateral for Bank loans.

Figure 6.1 STP Typical Funding v STP Age



The three dimensions of an STP developed in chapter 2, Figure 2.1 can be used as an objective and measurable starting point to classify public sector investment risk profiles for STPs. Further qualitative information such as the STP success factors discussed in chapter 3 and 5 can be added to refine the profile. Table 6.1 shows how risk profiles can be generated – these profiles do not replace judgement, but they could be used to indicate how intensive a review, feasibility study or investigation should be before initial and follow-on public sector investment in an STP is approved ie the more risky the profile the more intensive and extensive the review.

Table 6.1 More and less risky profiles for public funding of existing STPs

Risk Factors	STP profile 1 lower risk	STP profile 2 higher risk
Stage of Development	Early stage of development but already operational (0- 5 years)	Development stage (6 -11 years) but with limited evidence of a good track record and / or no supporting recent comprehensive review
Ownership and Governance Structure	Includes a University, preferably with strong R&D and extensive experience of working with businesses including SMEs Ownership is under the overall control of the public sector	A recent significant change of ownership and governance structure or no evidence of close working with a University or other major component of the knowledge base and little evidence of being integrated with relevant local and regional committees and groups
Regional RIS Scoreboard level	The local economy is has RIS scoreboard level between Moderate Innovators (high) and Innovation Leader (medium)[49]	The local economy falls within the Modest Innovator RIS category
Management	Senior management have private sector experience of innovation, science and technology and SMEs as well as some relevant public sector experience and the team has the experience and capacity to deliver (or manage the delivery of) professional services that will add to the efficiency of the local innovation ecosystem.	Senior management have no relevant private sector experience and are dominated by individuals with public administration backgrounds
Accreditation or Review status Business Plan status and Membership of Professional bodies	The STP has sought and secured an appropriate accreditation and / or have a business plan that updates the original feasibility study. And the management are regular attendees of a national or international STP Association that provides formal or informal CPD opportunities.	The STP has not investigated accreditation and is not a member of a national or international STP Association or if it is a Member is not a regular attendee at meetings. The STP does not have a documented business plan for the current year which has been approved by its governing board, council or other structure.
Alignment with Success Factors	The Board and management have adopted practices and structures designed to align the park with the key success factors for STPs.	The Board and management have not attempted to address critical STP success factors
Quality and quantity of outputs	Outputs are above average to well above average per € of public funds invested	Outputs are weak or well below average per € of public sector expenditure.

[49] Since innovation scoreboard levels are strongly correlated with economic strength, the highest scoreboard level is most likely to coincide with the most favourable development opportunities, where the private sector could be expected to play a significant role.

The new STP project

The new STP project is the most risky form of STP investment for the public sector, but it is the time when the private sector is least likely to participate and the need for public sector support is the greatest. The uncertainties and risks at this stage are best mitigated by professionally developed feasibility and planning activities. This has to go well beyond the normal property development feasibility study to include:

- An assessment of the market opportunity which ideally includes primary data gathered through market research with companies in the region as well as analysing secondary data
- The mechanisms and activities the STP proposes to deploy as it seeks to add value to the local innovation ecosystem
- The way in which the STP will integrate its role with other key local actors in the innovation ecosystem – particularly a university or other parts of the knowledge base
- Economic analyses that identify capital requirements and model the STP's finances to establish revenue requirement and the likely breakeven time
- Models of how the key socio-economic outputs are generated and initial estimates of anticipated volumes of outputs both in absolute terms and as a ratio to public sector investment
- The ownership, governance and management structure.

In the early 1990s, the European Commission offered an EU wide grant to help promoters of STPs to finance STP feasibility studies. The programme was known as "Support to Science Parks Action Line", and led to many new projects being initiated on a stronger foundation, but also revealed weaknesses in many projects which caused promoters either to delay their plans while they considered some of the more difficult issues raised in the reports or to cancel the plans indefinitely. Since that time, knowledge of STP practice has increased substantially both within the consulting profession and through the growing number of practitioners who have wide experience. National STP associations and IASP considerably add to the breadth of knowledge so there is no longer any reason for STP promoters to start a project without first taking extensive external advice.

Given the high level of risk at the start up stage of an STP, the absence of a balanced, well documented feasibility exercise, whether conducted by the promoters or by external professionals, should be a signal to public bodies receiving grant proposals that they should defer any decision until the feasibility work has been undertaken. Public sector promoter investors may feel that they are close enough to the issues to form a balanced investment decision. However, even in this case some external validation would be wise.

The STP in its Early Years

The early years of an STP can be considered as the time from the first company occupations until it is about 5 years old. In this period the general strength of the local market is established, operational practices are put in place and the range of networking activities and professional services will have been developed and should be expanding. The STP should also have developed strong links and working relationships with other organisations, particularly in the knowledge base, and be seen as bringing new strengths to the local innovation ecosystem.

In the first year or two from the opening of an STP, additional public sector investment can still be guided largely by the original feasibility work but obviously modified to take account of any significant positive or negative experiences that had not been foreseen at the feasibility stage eg costs higher or lower than expected, take up of space slower or faster than expected or difficulties with finding or creating sufficient numbers of good quality knowledge-based business clients etc. However, from year 3 or 4 onwards the STP will be establishing a track record. At this stage it should be possible to detect whether the park is likely to meet the promoters anticipated breakeven targets and, importantly whether or not the socio-economic outputs are likely to be generated at the rates foreseen when the project was approved for investment. By year 5, it is also a good time to look at the productivity of the different initiatives the STP management have instigated to support innovation, particularly with start-ups and SMEs, and determine whether these projects have the right scope and extent.

The evidence that 3rd party public sector funders could look for in support of proposals for capital or revenue from STPs in these closing 'early years' would include:

- Confirmation that the STP is securing demand of an appropriate quality at a rate that justifies the proposal for further investment in buildings. This should take into account the state of the business cycle and in particular the total amount of vacant space in any particular category (incubator, grow-on space, collaboration space etc) does not exceed more than about 3 years of anticipated net demand. This is to avoid the risk of over-building with the implications this brings for loss of financial sustainability
- Confirmation that their existing revenue projects that are seeking renewal or expansion are delivering the anticipated socio-economic outputs. Provided the immediately preceding confirmation is present then requests for revenue support for new projects to enhance the innovation ecosystem could also be considered
- Evidence that the park is integrating well with other key players in the local innovation ecosystem
- Evidence that the STP is broadly on track to meet promoter set breakeven targets.

If the confirmations are not available or the evidence is not positive, then public sector funders would be well advised to seek further information before making additional investment. However, unless there is a reason to believe that there is some general failure in the performance of the STP, investigations might be confined to just the one or two matters that give the concern and if they can be cleared then investment could proceed as proposed.

Clearly, if in seeking the above evidence, prospective public sector funders are seriously concerned by the answers they receive or they otherwise detect that the project is not performing then a plan of corrective action should be agreed with the STP before any further public sector investments are offered. These corrective actions could be the subject for an interim funding proposal.

The extent of any investigations at the post start-up early stage years could be guided by the general risk profile that the STP presents – see Table 6.1.

The maturing STP

Between years 5 and 10, an STP is likely to start to mature. This means that the park starts to secure a reasonable proportion of the final scale anticipated by the founders and establishes a range of

property offerings and services that are recognised as important features of the local innovation ecosystem.

This could be a time for the public sector to start stepping back or equally a time when investment might be boosted. Reducing public investment in property could be warranted if there is evidence of the private sector becoming willing to invest on terms that do not detract from the mission of the STP. The founders will usually be best placed to make this judgement provided that the STP has reached or passed a breakeven point and is generally deemed to be successful ie the founders should have no interest in risking a proven but still growing economic development success. The best positive reason for introducing or increasing private sector investment to an STP at this stage is that its capital requirements exceed the willingness or ability of the public sector to meet its capital needs whether for increases to the property stock or for major refurbishment programmes.

The case for increasing public sector investment is to support a project that is making good progress and would be held back in delivering increased socio-economic outputs without increased public investment which could not be secured from the private sector. However, this is the stage in a STP's life-cycle where robust reviews and evaluations are appropriate before these higher levels of public investment are made.

The scope of a review could embrace:

- An evaluation of the outputs generated by the STP per € of public sector expenditure. Typical outputs include:
    - Number of new jobs created or safeguarded
    - Number of knowledge-based industry jobs established
    - Number of new technology based businesses formed, including university spin-outs
- Assessment of the improvements the STP has contributed to the innovation ecosystem, including:
    - Additional lab and other specialist space not otherwise provided through the market
    - Additional technology incubation capacity
    - Networking and cluster stimulation programmes involving park and non-park based SMEs
    - New elements of infrastructure established for the locality, including 'seed' funds, business angel networks, mentoring and business advice services focused on technology sectors etc, and the outputs they have each generated
- Assessing the effectiveness of the governance structure and management in establishing the key STP success features (see chapter 2)
- Analysing the finances and financial structure of the STP to determine its sustainability as the rate of new public sector investment is reduced and eventually ceases
- Undertaking comparative performance analyses with other STPs based in similar economic and innovation ecosystem environments.

The objective of the review would be to determine the extent to which additional public sector investment will increase the rate of output generation and innovation ecosystem improvements. In addition, it needs to determine that such investment is necessary and will not displace potential private sector investment. Displacement becomes increasingly plausible if the STP is recognised as a

success in their local market. However, even for a successful STP the private sector may only be prepared to invest in the more attractive property investments and seldom will they support meaningful levels of revenue based project activities that are essentially designed to support SMEs. For this reason it is essential that public sector funders clearly differentiate between property investment and project activity when encouraging STPs to seek private sector investment.

Table 6.2 presents an analysis of the commercial status of various property investment opportunities arising on typical STPs. It is assumed that the private sector is already active investing in industrial and business park premises within the region, but not generally in STPs (this excludes special cases of investments by the private sector that is part philanthropy and part commercial).

Table 6.2 Attractiveness or otherwise of different property development opportunities on an STP to the private sector

Types of Development	Commercial Status	Typical Level of Public sector intervention	Comments
Land	Not commercial	75 – 100%	Returns only available on a 15 – 25 year timescale. Geared ground rents or 20 – 30 year soft shareholder debentures sometimes a possibility
Land remediation	Not commercial	100%	No known cases of a science park promoter bearing these costs when remediation high.
Offsite road works when necessary	Not commercial	100%	Minor offsite road works only undertaken by science park promoters
Onsite infrastructure: **Phase 1: for hub buildings** **Phase 2: beyond hub**	 Not commercial Depends on development serviced	 90 – 100% 0 – 100%	 Returns only available beyond 10 years Returns linked to returns on the property types developed off the infrastructure
Incubator building / Business Centre	Sub commercial	40 – 70%	Non-commercial where rental income is used to subsidise client development. Valuation yields of about 10% otherwise
University Institute	Often university built and owned but may be rented commercial property	0 - 100%	Funding package usually put together by a University from a broad range of grant sources including business donations
Training Centre	Sometimes Commercial	0%	Where demand is good the income returns to a University owner can be high
Grow-on buildings	Marginally sub commercial	15 – 40%	Where demand is good the income returns are not far below pre-let buildings but valuation yields are above pre-lets
Pre-let buildings	Commercial	0%	Usually value well with a good investment yields
Owner occupier building	Commercial	0%	Profitable development opportunity

The 'failing' STP and STP closure

A regime of reviews and evaluations as proposed above should avoid the situation where public investment in STPs secures disappointing or weak socio-economic returns, particularly if the intensity of the reviews is proportionate to the relative risk profile that the STP presents. Well applied, these techniques should also recognise hard to unlock potential that is worth securing through the application of patient money. In this latter case, analysis needs to concentrate even harder on the additional initiatives that the STP needs to undertake if that recognised potential is to be secured. This can be a situation where more investment and not less – but in a well-controlled and planned programme - is the most appropriate strategy.

Perceived failure in regions with hard to unlock potential

There is no doubt that unlocking potential becomes increasingly complex and difficult the weaker the innovation ecosystem in a STP's locality – this is underlined by the previously described research[50]. To explain the reasons for this, the EU Innovation Scoreboard classification system introduced in chapter 2 (Figures 2.3 and 2.4) will be used as a proxy for the performance of regional innovation ecosystems. Thus, in the many regions of the EU that the Innovation Scoreboard ranks as 'Moderate Innovators' or 'Modest Innovators' it must be anticipated that STPs will generally tend to underperform relative to STPs established in the 'Innovation Leader' regions. This relative underperformance is not the same as failing rather it is a recognition that in a region with a weak innovation ecosystem the level of investment needed to lift it substantially is very high. It is unreasonable to anticipate that STPs in this situation can emulate the performance of projects in better performing innovation ecosystems.

In effect, STPs in Modest and Moderate Innovator regions have to create a local microcosm where they identify all the key resources required for effective innovation and then operate networks and services that link these resources to the limited number of firms that have both the interest and capacity to innovate. They will also work with entrepreneurs to help them establish new innovation-based firms – but since the numbers of entrepreneurs with high qualifications and the proportion of the population willing to become entrepreneurs are both lower than for regions with higher scoreboard rankings, there is less high grade human capital for the STP to work with. Therefore the first noticeable effect is that STPs in these regions have either lower numbers of outputs or the outputs are of lower quality and sometimes both are in evidence. This should not be a reason for reducing or ceasing public sector investment but it is reason for seeking continuous improvement in the quality and numbers of socio-economic outputs generated by the STP.

This analysis does not mean that public sector investment in STPs in Modest and Moderate Innovator regions should be avoided. On the contrary, it means that investment in STPs in these regional categories needs to be made alongside increased investment in the other important dimensions of an innovative infrastructure. It also means that if an STP is going to be able to create an effective local microcosm of innovation excellence it will need to be:

[50] Chapter 2 discusses this research.

- Well-conceived with a socio-economic evidence-based plan that allows it to address those critical short-comings of the local innovation ecosystem that will otherwise reduce its potential to create worthwhile outputs
- Provided with adequate investment over an extended period
- Strongly led and managed by a team that have the requisite technical and commercial skills
- Thoroughly integrated with all the other key components of the local innovation ecosystem, such that actions it takes to address shortcomings in the innovation ecosystem are aligned and complementary to the actions of the other key actors.
- Given targets and KPIs that are linked to its evidence-based plan.

Investment in STPs under these circumstances is part of a long-term strategy to lift the capacity and strength of a regional innovation ecosystem and inevitably it will take far more time for these STPs to reach a stage when their scale and the nature and volume of their outputs can be expected to compare with STPs started at the same time in 'Innovation Leader and Follower' regions. This is not failure and it is not a reason to hold back public sector investment in STPs in the Modest and Moderate Innovator regions. However, it is a reason for moving forward with care, recognising the risks and planning how to mitigate them.

The logic above is exemplified by referring to the harder to unlock potential in Modest and Moderate Innovator regions. However, the same situations can occur in some Innovation Follower regions – but they are likely to be less severe. Nevertheless the processes described for assessing the situation and taking remedial action, including further investment would be the same.

Recognising and acting on STP Failure

The most common tangible signs of STP Failure appear to be a combination of 'mission creep' and financial difficulties both of which are described and discussed in chapter 5.

STPs also fail outright for financial reasons. As described in chapter 2, there are certainly recorded instances of this occurring in the USA, but similar instances in Europe are harder to identify. Common causes of STP financial stress are:

- Overbuilding with too much speculative space. This can lead to heavy finance charges and empty property costs with no offsetting rental income;
- Failing to achieve a critical mass of development so that operational overheads cannot be adequately recovered.

Once clear failure has occurred, ie the park has failed financially or mission creep has resulted in no discernible difference to a business park, then a sale to a willing buyer is the logical conclusion. The failure of the STP will have marred the reputation of the park to the point that it will no longer be credible to the other key players in the innovation ecosystem. Indeed, it is probable these other actors will seek to distance themselves from the park. It is entirely plausible that the full initial capital expenditure, including any public sector grants could be recovered through the sale, provided that the initial investments were soundly based and good occupancy had been maintained.

Since the start of the 2000 – 2006 ERDF programme the grant contracts require that all premises financed using ERDF must continue to be used for their grant funding purposes for a minimum of 20 years. This is entirely reasonable provided that the project remains sustainable. However, if financial

insolvency or mission creep creates a failure, then the effect of the ERDF grant contract is to substantially reduce the value of the property. The buyer has to either restore the project to its original purpose or face an uncertain financial penalty. Few buyers would be willing to pay anything at all for the property under these conditions. It would be far better that once the failure of the STP is evident and confirmed by an independent review then grant conditions should allow the following options to the grant recipient where it is not itself insolvent:

a. As now, they apply resources to restore the project to its intended purpose, or
b. They may sell the park to another organisation who is willing to restore the park to a proper STP, adopting the grant obligations for the balance of the 20 years, or if neither a. or b. proves to be possible even after a full OJEU notice open tender, then;
c. They may sell the project at market price (again by open tender) but at the point of sale they must repay the full original grant back to the EC via their local ERDF managing agent as a first call on any funds received.

If the grant recipient is insolvent, then provided local insolvency law allows, options b. and c. could still apply to the STP property assets as an obligation on the administrator of the insolvent grant recipient.

Thus far this section has concentrated on clear failure where a project reaches a point where it no longer exists as a recognisable public sector sponsored STP. More difficult to define and remedy is persistent underperformance. Qualitatively, the concept of underperformance would seem to be straightforward, but in reality it is complex. The influence that the state of the local economy and innovation ecosystem have on what an STP should be delivering and in return the market opportunities available to the STP on which it can grow means that an underperformance in an Innovation Leader region could be an outperform in a Moderate Innovation region.

One possible framework for assessing the performance of an STP is to examine its inputs and outputs in comparison with other STPs in similar Innovation Union Scoreboard regions. In this context the inputs would be:

- The range of facilities on the STP sponsored by the public sector (incubator, research institutes, training / conference centre, grow-on buildings etc)
- The quantity of those facilities
- The range of services provided by the STP to assist the start-up and early development of knowledge based businesses and to support SME and larger business innovation
- The numbers of businesses that the STP interacts with in delivering those services both within the STP and elsewhere in its local economy.

And the outputs would be the socio-economic outputs described in chapter 4 on evaluation.

An STP that has a relatively undeveloped range of inputs and clearly weak outputs at any given stage of its development whether early post start-up or at more mature stages could be deemed to be underperforming. However, establishing this underperformance would take a significant amount of analysis of the type described above for a review (and in more detail in chapter 4 on the theme of evaluation). If public sector funders required an STP to submit a new or recent review before they considered further public sector funding on all occasions the net effect may

be to deter some well performing STPs from accessing funding to maintain their good track record as it would add about 6 months or more to any bidding process. This lengthening of time together with the significant costs involved and the disruption as management and other staff time is diverted from delivery to the review would create the deterrent.

Many STPs do undertake periodic reviews, but these reviews might only occur once every 5 - 7 years or when there is a change in ownership or the park faces a significant challenge. A 5 year old review does not make a convincing proposal annex to substantiate current and prospective park performance.

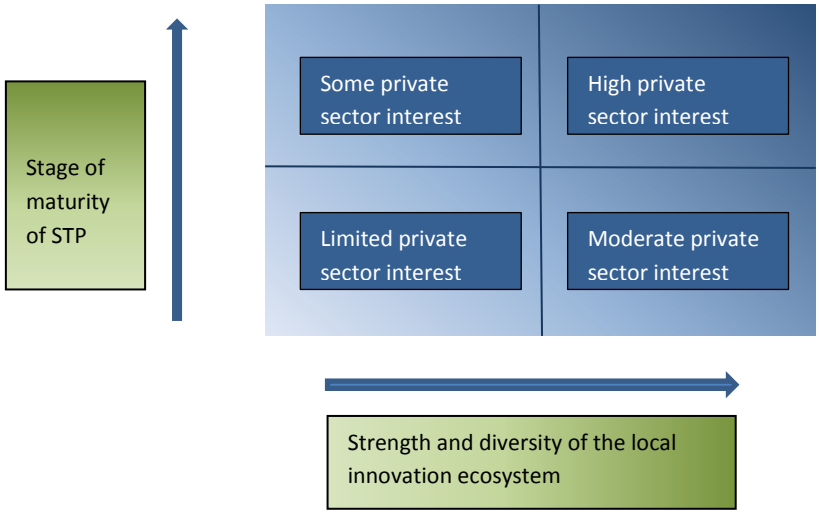
There are two alternative mechanisms that could be used to substantiate performance:

- Accreditation where it is re-approved every one to three years, such as operated by the European and Business Innovation Centre Network (EBN) or the STP adheres to one of the new quality models as discussed in chapter 5, or
- An update review based on the most recent full review that shows that the STP is performing as expected and within normally acceptable socio-economic output and viability criteria. This should be supported by a board or governing council approved business plan for the current year with projections for three or more years ahead.

Private sector financing of STPs

Figure 6.2 below when used in conjunction with Table 6.2 provides a useful framework for understanding when it is reasonable to anticipate private sector involvement in an STP. However, even for an STP which is mature and located in a region with a strong innovation ecosystem providing high intrinsic private sector interest, there are a number of issues that they need to consider.

Figure 6.2 A framework for private sector investment in STPs



While the private sector can be a valuable ally in providing capital for some of the more commercial types of property found on most STPs, the commercial property developer or investor's primary concern is to ensure that they can secure a good investment return. Ensuring that there is a good

potential supply of occupiers for their premises or a financially strong tenant is seen as the best strategy for securing a good investment return. Therefore they would usually prefer situations where either:

- The STP company (or a stakeholder such as a university) is the tenant and this tenant takes on the obligation to find and secure the desired occupiers; or
- The property developer is permitted to admit any occupier that they believe is reasonable, regardless of whether or not they are a knowledge-based organisation.

In the first case, this places a substantial obligation on the STP who will have to continue paying full rent even if they do not have an appropriate occupier for all of the accommodation. In the second, it creates a significant risk of mission creep.

As STPs are becoming more common across Europe, a small but increasing number of property financing and developer organisations are taking the STP movement seriously. LaSalle is probably the best known at present and they are active in at least two Member States. This new, well informed and more enlightened group of property financiers and developers are much less likely to seek the obligations described in the preceding paragraph. They have learned the language of the STP and understand the need for incubators, grow-on buildings and areas for collaboration. They are also more inclined to take the long view, not expecting their profits to come early and are prepared to make large investments in those STPs that they believe have substantial potential.

Nevertheless, even these enlightened financiers and developers have yet to fully appreciate the importance that 'soft infrastructure' plays in the role of a 21st century STP. They may have understood that working relations with the local university are important but they are still trying to understand what this means in practice. As a consequence they are more comfortable investing in localities that are in the Innovation Leader or Follower categories where the level and complexity of 'soft infrastructure' that a STP should be supplying tends to be less. The public sector can help best in these situations by sponsoring agreed projects that these private sector organisations can host in their STP helping the STP to become a fully integrated and operational component of the innovation ecosystem.

Conclusions

There are no simple or proven formulaic methodologies for determining when or to what extent the public sector would be rational in making investments in the development of an STP. These decisions require judgement and preferably judgement backed by analysis performed by those who have experience of STP projects.

The inverse relationship between the state of a local innovation ecosystem / economy and the extent of the interventions that an STP will need to make in improving the innovation ecosystem means there is no single 'correct' model for a new STP. The feasibility study is the most well understood approach to determine whether the public sector should invest in a new STP or not. These studies need to be undertaken by those experienced in the field working closely with the promoters.

Even though the start-up phase of an STP tends be the time when public sector intervention is relatively high, many STPs need and can often justify further public investment to progress towards

maturity. The key features to examine at this stage of the STP's lifecycle before further investments are made include: demand assessment, acceptable socio-economic outputs, evidence of positive integration with other parts of the innovation ecosystem and evidence that the STP is tracking towards the financial viability targets set by promoters.

When an STP approaches maturity, then formal evaluation and review become the tools of choice for assessing the case for new public investment.

Failure in STPs is sometimes perceived when in reality the park is facing 'hard to unlock' potential in a weak innovation ecosystem. In these cases more investment and not less may be the best strategy provided that management competence and good governance can be demonstrated. However, if an STPs finances are parlous and the recovery investment needed would be very high or if 'mission creep' has led to the STP becoming indistinguishable from a business or office park, then a sale of the assets may be in the best interests of public sector investors. These investors can then recover some or all of their investment and re-cycle it into other economic development initiatives.

Managing public investment in an underperforming STP as opposed to failure involves the greatest level of complexity. Risk profiles as set out in Figure 6.1 can help to put these cases into perspective. A recognised accreditation or quality standard or an update of a recent review together with a board approved business plan may be valuable in giving confidence that the STP is performing sufficiently well to justify further investment or that investment should be withheld pending improvements in performance.

Private sector investment in an STP carries risks as well as an opportunity to grow faster than may be possible by relying on public sector finance. There are recognisable limits to private sector experience of STPs as an economic development tool. However there is also a growing understanding of categories of STP buildings that allows the private sector to remains close to its comfort zone. Recognising and adapting to these realities can lead to successful public – private investment on STPs.

7 Conclusions

The report conclusions are organised into three sections:

- The conclusions that arise from chapters 1 to 5
- 'Dos and Don'ts' for public sector funding organisations, which include the principle conclusions from chapter 6
- The relevance of STPs to the 2014 - 2020 ERDF, ESF and COSME programmes

General report conclusions

The most significant policy driver for EU STPs is employment creation and in particular the creation of quality high value added jobs. The creation of new technology businesses is the leading second priority. Other frequently cited drivers are: being a highly visible centre for technology and innovation and technology transfer from the knowledge base to businesses.

The STP movement in Europe has developed to a considerable scale with about 750,000 people now being employed within park-based organisations. The public sector investment since 2000 in STP buildings is in the order of €11 billion and within that ERDF funding of about €1.6 billion has leveraged about a further €4 billion of public and private sector funding. The STP building programme over the last 12 years has resulted in the accommodation of approximately 350,000 of the total number of jobs on the parks with 140,000 of these being influenced by ERDF funding.

Also, STPs have used revenue streams to offer innovation and business support services to their clients both in the parks and externally. The services applied to external clients have supported about another 70,000 jobs, while the services applied to internal clients have probably helped to establish or safeguard about 90,000 jobs. However, about 40% of STPs operate or supply innovation and business support professional services at a minimal or basic level so their ability to multiply their impact on new job formation will be limited. There would need to be further research to identify whether the relatively low professional service levels by such a significant proportion of STPs is justified because these services are otherwise fully provided within the innovation ecosystem or whether there is some failing in management or governance. This is important where parks have substantial public funding.

The need and potential for an STP

There is increasing evidence that STPs see themselves and behave as actors within their local innovation ecosystem. This also accords with research findings and theory.

The 'need' and 'potential' for an STP are often defined in terms of the employment socio-economic outputs they can generate. However, it is rare for the 'need' to be explicitly linked to the improvements an STP could bring to an innovation ecosystem and hence at the planning stage of a new STP too great an emphasis is often given to the STP's land and property. A more appropriate approach would be to stress the identification of the combinations of property, services and partner working arrangements that are most likely to supply the 'need' for a more efficient and effective innovation ecosystem. In this context, the property is a means to an end and not an end in itself. The 'potential' then becomes an assessment of the additional employment and other socio-economic outputs that the new facilities, services and working patterns can be expected to deliver.

Planning a new STP

The crucial issues to address when planning a new STP if it is to secure the desired potential are:

- Setting out the strategy and objectives for the new park within the context of the regional innovation ecosystem and deciding on the best model for implementation
- Active engagement of the knowledge base
- Interaction with the public sector at local/regional, national and European level to secure and align resources
- Securing the land, capital and revenue to establish the STP and ensure its on-going growth
- Assessing the nature of the local skill base
- Addressing the availability of regional and national markets or corporate supply chains
- Selecting the package of services to deliver to tenant companies and businesses in the wider economy.

A well thought through approach to each of the above factors is an essential pre-requisite before a final commitment to proceed. It is normal for problems to arise in several of the above factors during the planning stage and each should be addressed and mitigated as part of the planning process before proceeding to implementation.

Operating and Improving an STP

Once an STP is operational its owners and managers should be committed to continuous improvement, making adjustments to its strategies and business plans in the light of their experience in operating within their market and local innovation ecosystem. The STP should ensure that it follows practice within a quality framework that embodies the following key success factors:

- A successful science park is – and cannot be – a stand-alone venture. All science parks are influenced by their economic and innovation environment and shaped by the implementation of regional, national and international innovation policies
- In order to be successful, a 21st century science park has to have both strategic and day-to-day management of the highest quality
- The 21st century science park needs to be a sustainable business. This means that the park generates enough income from its property and service delivery to ensure at least long term survival and at best a healthy rate of return on invested capital
- Intelligent property design that maximises the chances for innovation and 'serendipity' primarily through the collaboration spaces that are increasingly at the heart of today's STP
- STPs also have a responsibility to understand the different types of finance that their tenants and other clients need to survive and grow and in some cases to operate 'gap' funds.
- An active, effective, diverse and two-way university (or other knowledge-based partner) relationship is one of the defining characteristic of a 21st century STP. The emphasis on the exploitation of technology has given universities a new relevance to the global economy, and science parks act as a bridge between research and the marketplace
- Effective networking is imperative for the park management as well as for the companies on the park. Science park managers must network effectively to raise the profile of their park, ensure effective marketing and mobilise on-going support and sponsorship opportunities
- Ideally, in a science park the tenant relationship should be a very close one and the park team should add value by interpreting the opportunities arising from the business of each of their

clients. Some parks offer a range of support and advisory services themselves while others facilitate access to support services without getting engaged in it directly. The essential point is that the support is available for companies to benefit from and that it is easy and straightforward for them to identify and access it. Many STPs extend this support to other local knowledge-based business outside the park.

In setting out to improve its function the park executive and stakeholders need to recognise that in its approach to service, an STP should be clearly differentiated from the university by working from the perspective that the interests and needs of its business clients come first and then working with the university and other actors to create the types of innovation services that are most likely to lead to successful innovation.

STPs owners and managers should also be continually asking themselves whether they fully understand the complexities of business innovation and the barriers that companies, and particularly SMEs, face when innovating before examining their services and other locally available services and ensuring that there are service offerings available to their clients that effectively mitigate the recognised barriers. While STPs can improve their performance through internal actions alone, there is much to be said in favour of accreditation or any other similar process that involves constructive and helpful external review against a benchmark of good practice.

While the European Business and Innovation Network (EBN) provides a good accreditation system for Euro Business and Innovation Centres, it does not meet the needs of many STPs. A few national STP Associations within the EU are moving towards an STP review standard or process. These voluntary moves need to be encouraged and if necessary given some assistance to bring them to reality so that they can be trialled and the results disseminated for other STP Associations to adopt.

Evaluating an STP

Evaluation techniques start to be valuable once an STP has been operational for sufficient time that its outputs have become substantial and it is starting to realise a significant part of its potential and impact. While anecdotal evidence and expressed opinions may help to shape views whether a science park is successful and whether it plays an important role in its local/regional environment, collecting such evidence and views can only ever be the first stage.

In order to assess impact it is important to revisit systematically the scheme's objectives and interrogate managers, wider stakeholders and the beneficiaries of science parks (foremost the tenant and client companies associated with the scheme) about their views on impacts and achievements.

Evaluations are facilitated by having good monitoring data on key performance measures. While these will differ from scheme to scheme, there should be a core of common data. Historically, most STPs have been relatively weak in maintaining a good record of their outputs unless public sector funders consistently require it.

In undertaking science park evaluations, it is important to take into account that science parks are not the only players in the knowledge economy. They operate in an environment which, although they may want to influence it, also constrains them in what they can achieve. Factors such as the business start-up rate, entrepreneurial spirit, the availability of risk finance, infrastructure, labour

markets and many more at any given time are what they are and the science park needs to make the best of its environment.

Indeed, science parks can play a strong and pro-active role in facilitating an improvement in the characteristics of their knowledge economy and for that to happen cooperation between actors is seen as the primary route to more and better innovation.

Dos and Don'ts for public sector funding organisations

The key dos and don'ts for public sector funding organisations set out below are separated into the different stages of development of an STP as described in chapter 6.

Funding the start-up phase of a new STP

If the opportunity arises, potential public sector funders should support a well-founded feasibility study. This will ensure that in addition to understanding the opportunity they also appreciate any difficulties or weaknesses in the STP proposition being planned and can favourably influence the design of the project and also ask the 'hard questions' that need an answer to make public sector funding a reasonable proposition.

If any of the critical factors are not satisfactorily addressed by the feasibility study, then public sector funders should not offer funding until plans are changed to accord with good practice. Some of the more obvious conditions that must be met are:

- A good understanding of the market opportunity matched with a strategy that will unlock local/regional potential and also build new demand for the STP
- Clear identification of how the project will be led and managed, particularly with multi-promoter partnerships
- A good understanding of the key components of the local innovation ecosystem (See chapter 2, Table 2.4) and roles that the STP will play beyond the provision of property and property-related services.
- A clear recognition of the competition whether from other STPs (within 50km) or business and office parks and incubator projects

Funding the early stages of an STP

Once the promoters of a new STP have decided to proceed with construction and the evidence from the feasibility study or similar analyses are in place, the decision is then more about what types of property and revenue projects the public sector funders should be supporting.

The key projects for the public sector to fund are usually the land assembly, road infrastructure and the 'Hub' or park centre types of premises. 'Hub' premises tend to offer low financial returns but they can form the working heart of a good STP and in most areas where ERDF is accessible by STPs, the private sector is unlikely to invest. Some revenue funding to support the management team and property costs while rental incomes develop towards breakeven may also be essential at this stage. If there is some doubt about the scale of the market, public funders should invite the STP to develop plans for each hub building to be developed in two or three phases. Phase one will usually be less economic when this approach is taken but the risks of over-building (See chapter 5) are considerably lower and similarly any risk of wasting public money is reduced.

Initial innovation and business support projects designed to enable the STP to reduce weaknesses in the local innovation ecosystem should also be funded but at a low or modest level. At this stage the management team needs to prove their capability, learn and interact with the market and adapt projects to work in those ways that best meet the needs of local knowledge-based businesses. This process of adaptation can take two to three years.

Do not fund large pan-region revenue projects through the STP at this stage – the risks of failure with an untested team are simply too great.

Do not fund ambitious speculative building programmes. Any single phase of buildings that are publically funded should represent no more than two to three years of anticipated demand for the type(s) of property being proposed.

Funding the developing STP

In this context a developing STP is one that has developed at least the initial phases of their 'hub' or park centre buildings and shows evidence of successfully delivering some professional services to knowledge-based businesses in the STP and preferably also to similar businesses elsewhere in the locality of the STP.

This is a stage in the development of an STP where track record is being established and outputs are still modest such that a full evaluation (chapter 4) is unlikely to provide funders with a reasonable guide to the performance of the STP. The best guide as to whether to fund or not is the performance of the management team in delivering the initial goals of occupancy/usage for the buildings created and whether or not they are tracking towards financial sustainability in the manner desired by the promoters when the project was established.

Public sector funding at this stage is about developing capacity, strengthening capability as a part of the innovation ecosystem and ensuring that the STP is on track for financial viability. Funders should still be prepared to provide some 100% funding for buildings where there is no alternative but increasingly they should be identifying opportunities for the STP to secure an increasing level of new funding from:

- Bank borrowing secured against the new property to be created – possibly topped up with additional borrowing secured against the property assets already created
- Private sector investors for those classes of property that are most likely to offer a commercial rate of return (see chapter 6, Table 6.2).

Do not fund any phase of building development for which the STP cannot evidence historic as well as projected demand that will result in take up more than three years after completion. If the economy flattens and take up is one or two years longer, this should not produce a financial difficulty for the STP. If demand is better than forecast funders can always step in with additional phases.

Projects for innovation and business support being put forward by the STP should be showing greater imagination and a good understanding of what works best. Provided that projects funded at an earlier stage in the life cycle performed adequately or better, then this is the stage to increase the scale of projects operated by the park and the geographic scope. If track record in this type of activity is weak or not present, then treat these STPs as if they were still at the early stage of their development.

Funding the mature STP

A mature STP will have a well-developed set of property offerings relevant to the needs of knowledge-based businesses with a strong set of 'hub' buildings which have adequate space to support a variety of collaboration uses, whether university-businesses or business-business. The STP will have become financially viable.

Any public funding is now about helping the STP to achieve scale and economic development impact with the private sector becoming a dominant player for much of the incremental property financing. Additionality in the use of public money at this stage in the STP life-cycle is less about whether something that is not publically supported will happen or not and it is about:

- Achieving bigger, better or faster impact on the local economy and
- Securing leverage and closing gaps between the capital that the private sector (or the STP itself) can provide and the funding that is needed to secure buildings that meet market needs.

Decisions on funding can now be judged on track record and evaluation studies. To reach this stage of development an STP is likely to have been operational for five to ten years or more. It will be producing a steady stream of outputs that should be growing year by year from both its property and professional service offerings which can be used as the basis for the evaluation.

Public funders should not fund property at this stage unless there is strong evidence from the private sector of their unwillingness to provide the required support or the funding is needed for a non-commercial building for which there is a strong case that it will increase the ability of the STP to deliver greater economic impact.

Project financing criteria would the same as for the developing STP.

The failing or underperforming STP

The above descriptions represent the 'dos and don'ts' for an STP that is generally moving forward towards success and is performing to expectation. Chapter 6 describes in more detail the approach to public sector investment in STPs that are deemed to be underperforming or failing. The key issues here are:

- First, to be sure what the benchmark should be for performance since STPs in weak innovation ecosystem areas can be expected to have lower performance outcomes compared to STPs in stronger innovation ecosystem regions
- Second, STPs with a good management team and an appropriate governance structure facing short-term problems and operating in a weaker innovation ecosystem may still be worth supporting, provided they have sound recovery and development plans
- Third, there should be an exit mechanism for 'failed' STPs that will allows much or all of the public sector investment to be recovered and recycled into alternative economic development initiatives.

The relevance of STPs to the 2014 – 2020 ERDF, ESF and COSME programmes

The following paragraphs explore the priorities for the above EC programmes for the coming programme period.

ERDF and SMART specialisation strategies

During the current ERDF programme, of the EU STPs that operate in an area where the STP believes that ERDF is accessible to them, 71% have accessed ERDF for revenue support and 69% for capital projects. Therefore there is a high degree of awareness of this stream of funding and the objectives of the funding. The contribution that STPs can make to the 2014 – 2020 ERDF and other structural funding streams will relate best to those funds that are dedicated to innovation and the competitiveness of SMEs. The SMART Specialisation Strategies that regions will be producing to access the innovation component of the funding will present some issues as well as opportunities for STPs.

The schedule of EU STP technology strengths presented in Annex 1.2 shows clearly that the newer technology fields in ICT, digital and internet, life-sciences, energy and environmental technologies together with design and engineering services are all well represented on two thirds or more of parks. Where these technologies are part of a regional strength or, are a key enabling technology for a region's industrial and commercial strengths (for example in the field of ICT technologies), then an STP will be in a strong position to participate with other parts of the innovation ecosystem in delivering under a regional Smart Specialisation Strategy. A problem could arise for STPs that have been established to help diversify an economy into technologies that have a strong under-pinning from the knowledge base but are otherwise little more than an emerging sector in the regional economy. In these cases, there is a risk that an STP's clients in one or more of their diversification sectors will be disenfranchised from any support under a smart specialisation strategy. While this could be avoided by careful design of the strategy it nevertheless remains a risk by omission.

The precise role for an STP in a Smart Specialisation Strategy will depend in part on the role it has developed already under other programmes (See chapter 2, Table 2.4) and the ability of the STP's management to convince local partners of any new role they believe they can perform under the strategy.

Finally, as this report showed in Chapter 1, most STPs are already strongly engaged with those regional and local actors who are most likely to be developing smart specialisation strategies, they are therefore in a good position to influence the development of those strategies, particularly in the sectors where they have established strengths as identified in Annex 1.2.

ERDF and COSME

The strand of ERDF that is concerned with the Competitiveness of SMEs and COSME (the programme for the Competitiveness of enterprises and SMEs) are of considerable interest to STPs. Many of their clients have been formed by people that have strong scientific and technology skills but are often less experienced in the skills needed to operate and grow a business. Therefore access to finance, securing national and international markets, being able to innovate on an on-going basis, and knowing how to control their business and other competitiveness features of SMEs are matters that

STP support programmes often try to help their clients with. Two of the COSME objectives for 2014-2020 are to be found in the preceding list, they are:

- Facilitating access to finance for SMEs - 32% of STPs operate a seed fund and 77% provide services to help their clients to access sources of risk capital
- Helping small businesses operate outside their home countries and improving their access to markets. The Zernike programme described in chapter 5 and others like it are operated by many STPs
- Increasing the sustainable competitiveness of EU companies – 79% of STPs provide general business development designed to improve the competitiveness of their clients.

The two remaining objectives for COSME are:

- Creating an environment favourable to business creation and growth
- Encouraging an entrepreneurial culture in Europe.

These are also highly relevant to the work of EU's STPs since they need a strong entrepreneurial culture to be successful which is why 95% of STPs have an incubator or an incubation programme. In addition many STPs run specialised start-up programmes such as "Unispin" described in chapter 5 and the operation of accelerator programmes is gaining popularity with some STPs.

ESF

The 2014–2020 ESF is also highly relevant to STPs. The employee skill levels required by the client companies of STPs are generally high and cannot always be sourced from the labour market. Some STPs operate training programmes which can be of several types but two that are fairly common include:

- Entrepreneur training, particularly for first time entrepreneurs
- The use of new technology to improve business performance eg the use of social media and the internet for marketing.

In the new ESF programme there is to be **greater emphasis** on combating youth unemployment, promoting active and healthy ageing and more support will be provided for **social innovation,** ie testing and scaling up innovative solutions to address social needs. These shifts in emphasis provide opportunities for STPs. For example:

- Providing short-term project-based employment for recent graduates or undergraduates, even for just six to eight weeks, with work aligned with the technical discipline that the student is studying, multiplies the chance of employment for a recent graduate considerably. It is also an invaluable low cost resource for the SME clients of STPs and brings highly qualified individuals into the workforce at a level where their skills can be applied immediately
- Active and healthy ageing issues and other social innovations often employ ICT and related technologies such as 'big data'. This is a market opportunity for STP clients to work with social innovation projects in 'living lab' type projects which engage the social innovator (often managed by a public body), technology supplier and end-user in a highly controlled cycle of development and trial. Increasingly STPs are taking an interest in living lab and smart

city projects that have a social dimension although the number of STPs engaged in this activity is still small.

In all the above programmes an STP could play one of four roles:

- As a delivery partner acting at the local or regional level, ie beyond the STPs immediate tenant base. They may act as member of a consortium or alone.
- As an influencer advising delivery partners on the needs of their clients thereby helping to set the parameters for the outcomes of projects, eg the specific technology skill sets that STP client companies are looking for over the next 5 years as a desired output from skills training funded by ESF
- As a coordinator of demand for projects delivered by others – usually by signposting their clients on a demand led basis
- Providing an operational base for other delivery partners.

List of References

1. IASP 2012 world STP Statistics
2. IASP 2012 Statistics reworked to provide data for EU country STPs only – private communication
3. IASP 2013 EU STP Survey – private communication
4. IASP 2013 EU STP Case Study material – private communication
5. Monroe (2007) "Silicon Valley: the Ecology of Innovation
6. "Accelerating Client Growth – the strategic route to STP sustainability and regional economic Development", Rowe, IASP World Conference, Copenhagen 2011.
7. Fayolle, Lamine and Mian, (2011) Building Modern Regional Innovation Platforms: Evidence from the US and French STP Models, IASP Conference, Copenhagen
8. John Allen (2007), Third Generation Science Parks, Manchester Science Parks, Manchester, UK
9. Florida (2003) "Cities and the Creative Class" , City and Community 2:1 March 2003
10. Glaeser, Triumph of the City, Penguin Press, 2011
11. Townsend, Smart Cities – big data, civic hackers and the quest for a new utopia
12. H Chesbrough (2005) "Open Innovation – A new paradigm for Understanding Industrial Innovation",
13. Embracing Open Innovation in Europe - a Best Practice Guide 2012 www.euris-programme.eu
14. Rowe (2013) Creating Clustering Behaviour and Open Innovation in new Technology Industry Sectors through "Mini-Clusters", IASP World Conference, Recife, October 2013
15. Luger and Goldstein (1991), pp.74, 75. .
16. Leonel Corona, Jerome Detriaux and Sarfraz Mian (2007) Building Mechanisms for Nurturing Innovative SMEs: Lessons from North American Science Parks and Incubators
17. Angle Technology (2003) Evaluation of the past and future economic contribution of the UK science park movement pub UKSPA
18. Regional Innovation Scoreboard 2012, http://ec.europa.eu/enterprise/policies/innovation/files/ris-2012_en.pdf
19. Global Entrepreneurship Monitor, www.gemconsortium.org
20. http://ec.europa.eu/regional_policy/information/evaluations/guidance_en.cfm#2
21. Monck/Peters: Science Parks as an Instrument of Regional Development; proceedings from the IASP 2009 conference
22. An assessment of Firms Located on and off Science Parks in the UK, Storey et al, 1994, HMSO
23. Information from the Swedish Incubation and Science Park association (SISP) – private communication

Annex 0.1 Notes on the survey methodology and calculations and assumptions for employment and capital and revenue expenditure using the IASP 2013 survey data

The report author was able to influence the IASP 2013 STP survey of STPs which has been drawn on heavily in this report. IASP agreed to:

- Extend the survey to all EU STPs, not just their European members
- Include questions that:
    - Identified expenditure on capital and revenue over periods consistent with EC structural programme periods
    - Would enable employment gain estimates to be computed over the programme periods
    - Sought to clarify the objectives of EU STPs
    - Provided a general a picture of the nature and extent of the activities undertaken by the EU's STPs whether in support of tenants, or more widely with other similar types of SME in their region.
- Seek additional detailed information from a few STPs that had a statistical profile that suggested they were examples of good practice. When combined with the survey information, this provided the essential background for the compilation of good STP practice case studies at Annex 3.1.

Data Quality

Every effort was taken to secure a data set that approximated to a random sample and to validate the data.

The Survey Samples

The survey sample was not selected randomly. It was decided that the better approach was to seek a substantial sample by approaching all EU STPs with the help of national STP Associations and desk research. The population identified in this way was 366. All 366 parks were approached by email and invited to submit an online return. 129 parks provided complete or almost complete returns that could be included in the EU STP performance analysis. This represents a 35% return rate.

In terms of geography the sample is approximately representative as shown in Table A0.1a below. The significant discrepancies are France and Spain with a poor response rate from French STPs giving a definite under-representation and a high response rate from Spain giving a significant over-representation. The UK was also noticeably under-represented but not as heavily as France. The slight bias that this will give is mainly in the age distribution of the Parks since the UK and France were amongst the earliest adopters of STPs in Europe and have large populations of STPs (60 in France and 65 in the UK). Spain came later to the STP movement but has also become a major adopter with 58 recognised STPs. Only two other EU countries have more than 20 STPs and they are Italy (34) and Sweden (33), both of which are appropriately represented in the sample as are most of the 22 EU countries that have more than 1 STP.

Table A0.1a EU Member State representation in the IASP 2013 Survey

Countries surveyed	Nº surveyed	(%)	Nº responses	(%)
Austria	5	1,37	2	1,55
Belgium	6	1,64	2	1,55
Czech Republic	2	0,55	0	0,00
Denmark	9	2,46	4	3,10
Estonia	3	0,82	3	2,33
Finland	14	3,83	3	2,33
France	60	16,39	6	4,65
Germany	18	4,92	5	3,88
Greece	6	1,64	4	3,10
Ireland	1	0,27	0	0,00
Italy	34	9,29	13	10,08
Latvia	2	0,55	1	0,78
Lithuania	9	2,46	5	3,88
Luxembourg	1	0,27	0	0,00
Poland	18	4,92	6	4,65
Portugal	11	3,01	6	4,65
Slovakia	1	0,27	0	0,00
Slovenia	2	0,55	1	0,78
Spain	58	15,85	37	28,68
Sweden	33	9,02	12	9,30
The Netherlands	8	2,19	3	2,33
United Kingdom	65	17,76	16	12,40
TOTAL	**366**		**129**	
Total response rate	35,25%			

Tables A0.1b and A0.1c compare the IASP 2013 EU sample and the IASP 2012 Europe (members only) statistics for both completed building floor space and number of employed persons on the STP site.

Table A0.1b

Completed floor space (m^2)	IASP 2012 (member sample) (%)	IASP 2013 EU survey (%)
<15,000	24	34
15,000 – 39,999	27	22
40,000 – 80,000	21	18
>80,000	28	26
	100	100

Sample sizes 2012=62; 2013=126

Table A0.1c

On Park Employment (No. employees)	IASP 2012 (member sample) (%)	IASP 2013 EU survey (%)
<300	21	22
300 – 799	23	24
800 – 1499	15	17
1499 - 3000	23	20
>3000	18	17
	100	100

Sample sizes 2012=52; 2013=123

This analysis was conducted to detect whether there could be a sample bias towards larger or smaller STPs. This is important because if the samples were different in their detection of larger parks then this could exaggerate the estimated scale of the population when aggregating from the sample to the population. However, in doubling the size of the survey on the above scale factors (built floor space and on-sire employment), there is considerable consistency between the profiles of the two samples. However the bigger 2013 sample has proportionately slightly fewer large parks (by both floor area and number of employees) if the largest two scale bands are aggregated, compared to the 2012 data. [floor space: 2013 44% and 2012 49%; employment: 2013 37% and 2012 41%].

Although this effect is not large, a possible implication is that by relying on voluntary survey sampling as opposed to a strict random sample, may slightly prefer larger STPs or alternatively it might be that IASP attracts more large Parks into membership than the population at large. To mitigate this effect, whatever the reason, when calculations were performed to scale up from the sample to the population:

- First, all the largest STPs who might be regarded as outliers making a significant contributions to any final total were separated out
- The data from the remaining STPs were then scaled up on the same multiplier that would have prevailed had the outliers been included ie total estimated population (362[51]) divided by total relevant sample size
- The data from the outliers was then added back in with no multiplier.

As an indication of the effect of this on the final totals reported, if this adjustment had not been made:

- Total employment would have been about 200,000 higher
- Total capital investment would have been about €2.3 billion higher.

ERDF Eligibility / Accessibility

There are two levels of eligibility within the analysis. The first is that only STPs in European Union Member States (MS) were invited to complete the IASP 2013 survey. For consistency the IASP 2012 data was re-analysed to exclude non-MS based STPs such as those STPs in Russia and Turkey.

The second level of eligibility was the division of the EU STPs who responded to the IASP 2013 survey into:

- Those STPs that believed that ERDF funds were accessible to them within the context of the rules applied by their own MS in the periods 2000 – 2006 and 2007 - 2013. This group then contained samples of STPs that:
    - Received ERDF funding directly or indirectly for either capital or revenue projects or both
    - Did not bid for, or otherwise failed to secure, ERDF funding for any capital or revenue project in the relevant periods.
- Those STPs that believed that under the rules applied by their MS, ERDF funds were not accessible to them and consequently did not bid for or receive ERDF funding.

The subjective responses of the STPs to the questions on the accessibility of ERDF were taken to be correct on the grounds that not to know about such an important source of finance would amount to incompetence on the part of both the STP's management team and its promoters. The error rate is therefore likely to be low.

[51] NB The estimated population at the time that the calculations began was 362 which later increased to 366 as in Table 0.1a. This is a difference of 1.1% which is at the level of 'noise' and disappears within the rounded ranges of the calculated results.

Data consistency

A few straightforward checks were introduced to ensure that important numerical data received from survey respondents made sense. These were:

- A check on number of employees by computing the average floor space occupied per employee after allowing for reported percentage occupancy. For many parks, this figure lies between 20 and 30 m^2 per person but in premises with laboratories or other specialised facilities can be 2 or even 3 times greater. All numbers above 50 were queried with the respondent until a plausible reason for their number was provided, an assertion that the numbers were correct or their data was amended.
- A check on the capital expenditure range selected for the building construction and refurbishment between the years 2000 - 2012 was made by computing an estimate based on the floor areas of new build and refurbishment declared by respondents. Common sense parameters for typical office style STP buildings were selected for both refurbishment per m^2 and new build per m^2. When the reported capital expenditure deviated substantially from the computed figure respondents were asked to comment. This uncovered many errors of lost zeros or misinterpreted ',' and '.' separators in the figures for floor area built and refurbished and in other cases, plausible reasons why the computed capital expenditure fell a long way outside the range they had selected. In some cases land costs had been included, which needed to be removed, and in other cases the buildings had been largely labs, including special research facilities and equipment which are considerably more expensive per m^2 that office buildings, sometimes 2 – 3 times the cost per m^2. In nearly all cases a rational response was received so that the data was either changed by the respondent or the explanation made sense.

In only a few cases was it not possible to reconcile the data against the checks, mainly because the respondents asserted that the numbers provided were correct but without explaining the discrepancy to the cross-check. Since the cross check is no more than a guide, the calculated values were never used to replace an un-reconciled respondent's answers.

Data handling approximations

There are five important areas where important assumptions and approximations were used to derive the expenditure and employment data reported in the main body of the report. These are:

- Calculation of the expenditure when the range chosen is open ended at the top of the possible expenditure ranges that could be selected by a respondent (eg >€100 million)
- Calculation of the new employment influenced or assisted by STP capital expenditure on new buildings over the period 2000 – 2012
- Calculation of the revenue expenditure attributable to the support of SMEs outside the premises of STPs
- Calculation of the new employment influenced or assisted by STPs in the region beyond their premises.
- Calculation of ranges given in Tables from the aggregate of the ranges selected by respondents

These are treated in turn in the following short sections.

Approximations made when respondents chose the highest expenditure bands

For both capital and revenue expenditure survey, respondents were asked to choose from one of several ranges (see survey questions below). This was done to avoid respondents feeling that they had to make extensive calculations to provide an exact and precise answer, which would have undoubtedly resulted in a very significant decrease in the number of surveys completed.

In each case there was an upper band which was simply a >€x million. These upper bands were:

- >€100 million for capital expenditure between 2000 and 2012 which was selected by 7% of the surveyed STPs
- >€80 million for revenue expenditure on professional services between 2000 and 2012 which was selected by under 2.5% of the surveyed STPs

These figures were included in the calculations of totals in the following way:

- The figure of €100 million was used for the capital expenditure as a fixed single figure unlike other ranges where the bottom of the range was selected as a minimum and the top as the maximum to provide an estimate of the range for reporting in the main body of the report. The only exceptions were the few large parks who also provided an exact figure in addition to checking the >€100 million box. This treatment was used to avoid the risk of overstating the capital expenditure when numbers are grossed up from the sample to the population.
- A similar treatment was given for the figures for revenue expenditure, although in this case the number of parks was so small at 2.3% that any overstating through grossing up to the full population is unlikely so the minimum was set at €80million and the maximum at €100 million. With this treatment the maximum risk of overstatement on the reported grossed up level is below the 1% level so as noted above becomes lost in the rounding of the reported numbers.

Calculation of new employment from STP capital expenditure on premises

The three key figures from the data gathered in the survey that were used to compute the new employment assisted or influenced were:

- The total floor area of the STP **completed** as at July 2012
- The new build floor area **completed** during the two structural fund programme periods 2000 to 2006 and 2007 – 2013 but with the latter period curtailed to July 2012 by which new buildings had to be completed.
- The total employment at the STP as at the survey date in July 2012.

The calculation was then simply to divide the new build (2000 – 2012) by the total build and use this as the fraction of the total employment attributable to the new build.

This could be criticised as providing a bias towards over-statement of the new build effect on the employment numbers since the occupancy of more recently constructed buildings is likely to be lower on average than older building stock. However, it has to be remembered that:

- Approximately 50% of the STPs had their entire stock of buildings created during the period 2000 – 2012, so for these STPs the calculation is entirely valid.

- For the buildings created in the 2000 – 2006 programme period there will have been several years for these buildings to secure a good occupancy approaching the normal average for any given STP. Assuming a consistent pace of STP building construction over the entire 2000 – 2012 period this means that a further 25% of the new build will have had time to secure normal average occupancy.
- Therefore only 25% of the new build properties might have been operating below normal occupancy and it is clear from the high occupancy rates being achieved in 2012 (average 79%) that new buildings could only have been remaining substantially unoccupied for a very limited time following completion in a relatively few cases.
- Furthermore, the impact of the financial recession on EU STPs was to create an average reduction in occupancy of only 8% during the height of the recession which was fully recovered by 2012. This overall resilience by STPs suggests that on average properties do not remain vacant for long and it is well recognised amongst STP operators that the newer properties tend to be the first to be filled.

This evidence suggests that even though there is probably some over-statement of the employment influenced or supported by the new build programmes of STPs due to voids in the newest premises, it is unlikely to be large and is certainly less than 25% and more plausibly in the range of 5 – 10% as a guesstimate, given the factors described above. However, it was decided not to reduce the new employment number since:

- Any reduction applied to the new employment would be arbitrary
- Within one or two years it will have become valid as the occupancy of the last of the new buildings rises at which point it may even become an understated number (because the total to which the relevant fraction is applied also will have risen).

Calculation of the revenue expended by STPs in support of SMEs inside and outside their premises

The calculation of the revenue expended by EU STPs in providing professional business and innovation support to SMEs outside their own premises required several assumptions to be made which cannot be supported by the data from this or other surveys. These assumptions are purely those invoked by the author on the basis of wide experience across more than 20 years in providing business support and innovation services to SMEs across the locality and region of an STP as well to companies on the park.

The data sets used from within the IASP 2013 survey were as follows:

- The total revenue expenditure on business and innovation support services during the period 2000 – 2012.
- The statements of whether:
    - Business support services were provided only to tenants, to both tenants and other similar SMEs outside the park, or the services were not directly supplied by the STP
    - Innovation support services were provided only to tenants, to both tenants and other similar SMEs outside the park, or the services were not directly supplied by the STP.

The assumptions made on how the relevant services expenditure should be divided between companies on the STP and external companies in the locality depended on the level of expenditure being incurred by the STP. Experience strongly suggests that while the level of resource being applied to the above services by an STP is small or modest then by far the majority, if not all, of the expenditure will be expended on tenants. However, once larger delivery teams and / or budgets are created the proportion of the funds taken up by innovation-led companies outside the park rises and overtakes and very quickly comes to dominate the resources taken up by companies within the park. Thus the simple approximation rules shown in Table A0.1d were used to calculate the expenditure to be allocated to the support of companies within the STP and to external companies.

Table A0.1d – Allocation of STP professional services expenditure to companies external to the park

How and to what companies the services are provided	Expenditure proportion allocated to companies in the park	Expenditure proportion allocated to companies external to the park
When expenditure is: "tenant companies only" - all expenditure levels	100%	0%
When expenditure is: "services are not directly provided" – all expenditure levels	100%	0%
When expenditure is "both tenant and external companies" expenditure levels <€1M only	100%	0%
When expenditure is: "To both tenant and external companies" – all expenditure levels >€1M	20%	80%

It might seem that the above rules will bias business support and innovation services expenditure in favour of external companies, but this is not the case because only 40% of all EU STPs had revenue support services financed at a level of over €1 million in total over the period 2000 – 2012. However, it was this minority of STPs, particularly those with professional services revenue spending of over €5 million that accounted for 93% of expenditure where external as well as tenant companies were supported. At a level of expenditure of €5million (or about €0.5million pa), or above, it is highly probable that between 80 and 95% of the expenditure will be on companies outside the STP. Thus, in the absence of research to prove otherwise, the assumption appears to be reasonable.

Calculation of jobs supported or induced from STP revenue expenditure on business and innovation support activities

The calculation of jobs induced or supported by STP revenue expenditure on business and innovation support has less substantiation by way of logic or analysis than any of the other numbers. The data available from STPs on the outputs of jobs created supported by their business and innovation support expenditure programmes was sparse. However, about 10 parks provided sufficient data to allow an estimate of cost per job to be derived. The average was €15,000 per job but the range extended form as little as €1500 per job to €52,000 per job with figures in the range of €5000 - €10,000 per job being the most common. To ensure that the risk of overstatement of job

creation was kept low, a figure of €20,000 per job was selected. This is well above the average of the admittedly small sample but is also in line with the mid to higher end of cost per job acceptable as value for money under ERDF funding programmes. The author has experience of delivering new high quality employment with ERDF and other public funding at significantly lower levels than €20,000 per job but accepts that sometimes higher levels of cost per job can be justified. Nevertheless, the figure chosen is a reasonable working average to avoid over-counting of the STP jobs induced or supported by revenue expenditure.

Calculation of ranges given in Tables from the aggregate of the ranges selected by respondents

For capital expenditure and revenue expenditure respondents were offered bands often with a zero as the base. Then, for the top value a >€xxx million value was provided at the top end which was treated as described above. For all other bands the rules followed in calculating a maximum, minimum and central value were as follows:

- For capital expenditure:
    - The lowest band, excluding zero was <€2million. The low value for this range assumed was €1m and the high value €2m. The low value is justified by the fact that few new build or major refurbishments could possibly have been much below this figure given the number of sq. metres being created or refurbished in nearly all cases. A value of €1.25m was taken as the central number to provide a bias towards the low end of the range
    - For all other bands the low value is the lowest number in the range, the high value is the top number in the range and the central number is the arithmetic mean of the top and bottom numbers.
- For revenue expenditure:
    - The lowest band excluding zero was <€1m. The low value for this range was assumed to be €0.1million and the high value €1m. The small low value was chosen out of prudence as there was no other variable to provide an insight into the possible level of expenditure, unlike the floor area in the case of capital expenditure. The central or mid value was taken as €0.4 million.
    - For all other bands the low value is the lowest number in the range, the high value is the top number in the range and the central number is 95% of the arithmetic mean of the top and bottom numbers to provide a moderating bias for the reason given immediately above.

In Conclusion

Given the time and resource limits for this advice and guidance report, the above methodology with its approximations and assumptions probably understates rather than overstates the gross outputs of the population of EU STPs. The alternative of running true random sampling and seeking sufficient detail to obviate the need for many of the working assumptions was simply not available under the terms of reference and budget.

Nevertheless, given the tendency to err in favour of understating outputs in the face of uncertainty it is reasonable to believe that the financial and employment statistics derived for this report from limited data are sufficiently robust to provide a reliable policy guidance framework.

Annex 0.2 Terms of reference for the guidance report

TITLE OF CONTRACT

Guide on good practices for setting up, managing and evaluating of Science and Technology Parks

CONTEXT

Over the past three decades substantial amounts of ERDF and national and regional budgets were invested in the set up and running of Science and Technology Parks in the EU. These investments were made in the expectation that STPs would:

- Stimulate the flow of knowledge and technology between universities and companies.
- Facilitate the communication between companies, entrepreneurs and technicians.
- Provide environments that enhance a culture of innovation, creativity and quality.
- Focus on companies and research institutions as well as on people: the entrepreneurs and 'knowledge workers'.
- Facilitate the creation of new businesses via incubation and spin-off mechanisms, and accelerate the growth of small and medium size companies.
- Work in a global network that gathers many thousands of innovative companies and research institutions throughout the world, facilitating the internationalisation of their resident companies.[52]

Evaluation of the impacts of such parks in terms of innovation and socio-economic performance in the region that sponsored them, gives a mixed picture[53]. Evidence suggests that the performance of a park depends partly on the specific innovation system and other science and business relevant conditions in a territory. Partly, however, the performance of a Science and Technology Park depends on policy and management choices in terms of the design of the legal, financial and physical set-up, management, growth and diversification of the parks.

The exact numbers of ERDF support for such parks is also not known due to the nature of the reporting obligations of the Managing Authorities.

OBJECTIVE

The objective of the present contract is two-fold:

- Provide practical guidance to Managing Authorities, policy-makers and STP managers that will allow them to better design or evolve STPs and identify situations when the closure of an STP is indicated. This should draw on the knowledge and expertise of the contractor, existing evaluations of STPs, literature review, etc.

[52] See International Association of Science Parks

[53] See Albahari, Alberto and Pérez-Canto, Salvador and Landoni, Paolo (2010): Science and Technology Parks impacts on tenant organisations: a review of literature. (http://mpra.ub.uni-muenchen.de/41914/)

- Provide evidence of the extent to which the Structural Funds have contributed to the development of Science and Technology Parks (STPs) in EU Member States over the last decade and the impact this has had on the innovation performance and economic development of the territory in which the STP is located. This will include the collection and digestion of quantitative and qualitative data through the International Association of Science and Technology Parks and Areas of Innovation - Europe Division (IASP-E).

The guidance and evidence will be based on existing quantitative and qualitative data available to the expert and to the IASP-E and desk research. To the extent necessary, additional data will be collected directly from STPs using an on-line questionnaire approach that will elicit data on their activities, legal and financial set-up and the EU capital support received for investment in infrastructure and buildings and also, if possible, revenue support for innovation projects and business support activities. This should mainly consider ERDF support, and where possible also ESF, CIP, FP and other EU programmes where the funding is both significant in volume and relates directly to the work of the STP as opposed to R&D conducted by resident companies or any university or research organisations linked to the STP. Information on other private and public financial support should also be gathered. Employment and numbers of companies supported by the STPs will be the principal quantified reporting output variables and the degree of integration of STPs in the overall economic tissue and inter-action with educational, research and societal actors in the territory should be reported as qualitative data based on STP self-assessment.

In addition to the analysis of data, relevant desk research and authoring of the report, the Expert will carry out further information gathering as necessary to provide good practice examples for the guidance.

TASKS & PROVISIONAL PLANNING

The Expert will present practical guidance to STP managers and political decision-makers allowing them to either (1) set up a state-of-the-art STP, adjusted to the business and research potential of the territory where the STP will be located, or (2) improve the functioning of existing STPs, or (3) to identify when the public support to an STP shall be ceased.

The contents of the report will be structured to cover the following aspects:

1. Introduction: STPs and their contribution to regional economic development through innovation, including the main quantitative data on the public support to STPs in the EU, in particular the ERDF support, the impact of STPs in terms of employment and enterprise development. What might have been the situation without ERDF support. (2-3 pages)

2. How to identify the need and potentials for a new STP in a territory: What type of socio-economic and innovation performance can be achieved through STPs. What can an STP not deliver (possibly with brief pointers to other forms of innovation and enterprise support). What economic landscape, legal, administrative and financial conditions, innovation eco-system, knowledge providers, skills profile, social capital, infrastructures and other assets are necessary for an STP to function. (5-6 pages)

3. How to conceive a new STP: Which models for STP exist, description of their respective advantages and disadvantages, guidance for identifying the most suitable for a territory, for how to develop a business plan for an STP, attract relevant players, etc. (5-6 pages)

4. How to evaluate existing STPs: which indicators (financing of STP, infrastructure, employment, innovation performance, cost-benefit, services provided, positioning in value chains, access to finance, skills, markets and cooperation partners of firms in STP, SMEs vs. large firms, etc.), which time-frames (how many years does it take for an STP to mature and attain full performance …), internal vs. external perspective (how does STP compare with others inside and outside the territory, spill-over effects on socio-economic performance of territory, etc.) (3-4 pages)

5. How to operate and improve an STP: How to improve the functioning of existing STPs, depending on the evaluation results, importance of the management team, interaction among STP firms and knowledge actors, cooperation with other STPs, universities, clusters, diversification / differentiation, etc. (5-6 pages)

6. When is it time to close an STP or cease public support: Identify whether or when it might become appropriate to withdraw public (incl. EC) support to an STP, either because it is able to make its way forward purely with private sector finance or because the project shows little evidence of producing the anticipated and desired benefits, e.g. due to an unfit legal / financial set-up, technological orientation, geographic location, lock-in effects, performance lags behind competing STPs, lack of financial self-sustainability, etc. (2-3 pages)

7. Conclusions: summary of the main STP models, and of the main “do’s” and “don’ts” in terms of public support to STPs and when it is time to close an STP. Ideas, opportunities and recommendations for the role of STPs in the forthcoming programming period 2014-2020 (ERDF, ESF, COSME, Horizon2020, incl. EIT-KICs, PPPs, etc.). (2-3 pages)

Annexes: Results of quantitative and qualitative data collection and analysis, case studies, literature list, useful links, etc.

Overall length: 50-60 pages.

Annex 0.3 IASP 2013 EU STP SURVEY QUESTIONNAIRE

The following text forms the instructions and questions used for creating the IASP 2013 EU STP on-line Survey which was sent to 366 EU STPs, often with the support of the relevant national STP association, which resulted in 129 completed surveys.

Introductory statement to be placed at the opening page of the survey

Why is this survey necessary or important?

The European Commission is seeking guidance on the roles played by Science and Technology Parks (STPs) across the EU in their respective regions. They are also seeking to better understand the impact that ERDF and other European funding has had on STP development and the nature of the economic effect they are having on their local economies. IASP – European Division under the leadership of Josep Picque (President) and IASP CEO Luis Sanz will be leading the data capture exercise and advising David Rowe (former CEO of the University of Warwick Science Park) who has been invited by the Commission's DG for Urban and Regional Policy to lead the preparation of a report on these matters.

A letter from Dr Mikel Landabaso, Head of Smart Sustainable Growth at the Directorate for Regional and Urban Policy of the European Commission accompanies the email link to this survey. It explains the significance of the work being undertaken and the need for your participation. We believe it is an important document for you to read.

The <relevant country STP Association> are aware of this survey and have been supportive in helping to ensure that this survey reaches all relevant STP's in <name of country>.

Confidentiality of data provided by you.

The data gathered will be aggregated to provide an overview at the EU level of the activities of STPs and they will never be made public or presented in such a way that any single STP or any individual respondent could be identified without their prior approval.

Part 1 Profile Information

The initial set of questions is about the scale and location of your STP. But first please help us by providing a little information about yourself:

Are you:

The senior executive officer for the STP Y/N radio buttons
The deputy senior executive officer for the STP Y/N radio buttons
Other managerial position, please specify: <Box for data>
Employed by Tick (check relevant button):
Question logic: allow one only of the of the following buttons to be checked
The STP radio button
The associated University or other research organisation radio button
Local government or a regional development organisation radio button
A company other than the STP radio button

How long have you worked on the STP project (select one):
Question logic: allow only one of the following three radio buttons to be selected.
<5 years radio button
5 – 10 years radio button
More than 10 years radio button

In case we need to follow up on information provided in this questionnaire, please provide:
Your telephone number: <Box for data>
Your name <Box for data>

2. Name of STP <Box for data>
3. Address <Box for data>
4. Country <drop down menu>
5. Land area in hectares <Box for data> or acres <Box for data>
6. Floor area of completed buildings (m^2) <Box for data>
7. No. of employees on site <Box for data>
8. No. of organisations on the site <Box for data>
9. No. of non-company organisations on site within the above total (e.g. research institutes, public organisations, etc.) <Box for data>
10. Current occupancy of buildings (% of total completed floor space) <Box for data> %
11. What would you estimate as the lowest level of occupancy during the 2007 – 2012 recessionary period (% of floor space) <Box for data>%

Part 2 - Your STP in the context of the Local / Regional Economy

12. Which of the following categories of services does your STP provide whether to the STP's tenants only or to both tenants and other similar companies outside the STP (check all that apply)?: STP Tenants External companies

    Question formatting: set this question up with radio buttons in three columns under the headings Services supplied to STP Tenants / Services supplied to both Tenants and External Companies / Services not directly supplied

    a. Property related e.g. meeting room hire, café, office cleaning, etc.
       radio button (r/b) r/b r/b
       Electronic communications e.g. broadband, digital telephony, video conferencing r/b r/b r/b
    b. Business support (e.g. finance , marketing, training etc.) to support the growth or start-up of young or SME businesses r/b r/b r/b
    c. Innovation support (e.g. R&D, tech transfer services, etc.)
       Networking - bringing together businesses from both within the Park and outside for specific events r/b r/b r/b
       Other 1 please specify <Box for data> r/b r/b r/b
       Other 2 please specify < box for data> r/b r/b r/b
       Other 3 please specify<box for data> r/b r/b r/b

13. Does the STP actively network external professional services into the Park to help its SME clients to:
    a. Raise risk capital or loan finance Y/N r/bs
    b. Improve their marketing Y/N r/bs
    c. Develop better financial controls Y/N r/bs
    d. Overcome other business related problems, if yes please specify: <Box for data>

14. Do any of the senior members of the STP management team, including the STP's Director / CEO:
    a. Participate regularly in committees related to regional / local SME innovation programmes Y/N radio buttons
    b. Participate regularly in committees related to regional / local start-up and SME business support programmes Y/N radio buttons
    c. Regularly attend any University committees Y/N radio buttons
    d. Regularly attend any Chamber of Commerce committees Y/N radio buttons
    e. Chair any sub groups or committees of local or regional actors relevant to the work of the STP Y/N radio buttons
15. How important have the following organisations been in financing the development of the STP? Use the radio buttons to rank the importance of each organisation - as one of: Very Important, Moderately Important, Marginally Important, Not Important:
    This question is to be set up in table format with the heading attributes very important, moderately important, etc across the top with radio buttons under each heading against

each of the items listed at a. to f. The logic for this question must limit the responder to select only 1 of the 4 buttons in each row.

a. Local government choice from 1 of 4 radio buttons
b. National government choice from 1 of 4 radio buttons
c. Regional economic development organisation choice from 1 of 4 radio buttons
d. Banks choice from 1 of 4 radio buttons
e. The University or Research Organisation choice from 1 of 4 radio buttons
f. European Commission (ERDF / ESF/ CIP / FP etc) choice from 1 of 4 radio buttons

16. Which of the European sources **at f. above** has been the most important? <Box for data, free form text>

17. Indicate your view of the most important contributions the STP has made to the local economy. Choose 5 from the following, marking the most important as 1, the next most important as 2 and so on until you have marked 5. Question logic <in box for data with indicated logic> must allow only: the numbers 1 to 5 to be placed in the data boxes and each number can be used only once and the respondent to be reminded if they do not make 5 entries.
    a. Employment creation <Box for data with indicated logic>
    b. High quality employment creation <Box for data with indicated logic>
    c. Technology transfer from knowledge base (university etc.) to businesses <Box for data with indicated logic>
    d. Diversification of the industrial base of the local economy <Box for data with indicated logic>
    e. Inward investment of technology companies <Box for data with indicated logic>
    f. Creation of new technology businesses <Box for data with indicated logic>
    g. Being a highly visible centre for technology and innovation in the local area <Box for data with indicated logic>
    h. Having specialised property and facilities for technology businesses <Box for data with indicated logic>
    i. An excellent working environment that attracts and holds high quality technical staff <Box for data with indicated logic>
    j. Other Please specify <Box for data> and <Box for data with indicated logic>

18. What were the key obstacles you had to overcome in establishing your STP? <Box for data, allow up to 500 words>

19. What were the key obstacles you had to overcome in growing your STP? <Box for data, allow up to 500 words>

20. What do you see as the major opportunities for your STP in the short and medium term? <Box for data, allow up to 500 words>

Part 3a – Developing and Financing Your STP (for STPs who believe they were in an EU region or Member State where they were able to bid for and receive ERDF funding) [54]

21. Was your STP in a geographic area where it was eligible to bid for ERDF financial support for at least some part of the time between 2000 and 2012 Y/N radio buttons.

Questionnaire logic:

If YES then go to Q22.

If NO then go to Q33.

22. Was your STP in a geographic area where it was eligible to bid for ERDF support for:
    a. The ERDF programme period 2000 – 2006 Y/N radio buttons
    b. The ERDF programme period 2007 – 2013 Y/N radio buttons

23. Has the Park received any ERDF or ESF funding during the period 2000 – 2012 (for capital projects or to support revenue activities) as either or both:
    a. Direct grant payments to the STP with the STP securing any matched funding whether from public or private sources Y/N radio buttons
    b. Indirect grant payments paid through a local government, university, regional development authority etc. where the intermediary organisation has also been responsible for all or most of the matched funding Y/N radio buttons

    Capital Projects (Building works)

    Thinking first about the development of new buildings, fit out of buildings by the landlord to meet tenant requirements or the substantial refurbishment of older buildings on your STP

24. What was:
    a. The approximate gross area (total area of all the floors in buildings) for new buildings developed on the STP over the period 2000 – 2012. <Box for data> m^2
    b. The approximate gross area (total area of all the floors in buildings) for buildings undergoing a major refurbishment or fit out to meet tenant needs over the period 2000 – 2012. <Box for data> m^2

25. Select the appropriate range from below for the total capital costs for all new build, fit out and major refurbishments over the period 2000 – 2012.
    Question logic: only one of the following 9 radio buttons can be selected.

[54] See page 113 of Annex 0.1 for the definition of ERDF "eligibility", the survey analysis accepted the subjective response of each STP to these questions, on the assumption that they would be aware of the availability of this important source of funding. The wording of the questions was chosen to relate to terms easily recognised by most STP management teams even though they may not be strictly accord with the legal definitions

a. 0
b. <€2m
c. €2m – €4m radio button
d. €5m - €10m radio button
e. €11 - €20m radio button
f. €21 - €40m radio button
g. €41 - €80m radio button
h. €81 - €100m radio button
i. >€100m radio button

If the radio button ">€100m" is selected send an alert "high capital spend recorded consider follow up telephone call".

26. Select from the three sources below the bands that you believe most closely represent the constituent components of the sources of finance used by your STP for new construction or the major refurbishment or fit out of buildings over the period 2000 – 2012.
The logic for this question must limit the responder to insert only numeric data and the sum of the entries at a., b., and c. must equal 100.
    a. ERDF (whether direct or indirect) (%) <data box>
    b. Other Public sector sources (e.g. Local and national governments, regional development Authorities, Universities, other publically funded research organisations, etc.)(%) <data box>
    c. Private Sector sources (private sector property developers, the STP's own resources, Bank borrowing) <data box>

Revenue Projects (ERDF and ESF)

Thinking now about revenue projects where the STP is providing knowledge-based SMEs and start-up companies with professional business support, training, technology transfer or access to finance services (including any capital for investment or grant funds to support start-ups and SMEs)

27. What was the total cost of the revenue support in the period from 2000 – 2012? Select the most appropriate range below:
Question logic: only one of the following 8 radio buttons can be selected.
    a. €0 radio button
    b. <€1m radio button
    c. €1m – €2m radio button
    d. €3m - €5m radio button
    e. €6m - €10m radio button
    f. €11m - €20m radio button
    g. €21 - €40m radio button
    h. €41 - €80m radio button
    i. >€80m radio button

If the radio button ">€80m" is selected send an alert "high revenue spend recorded consider follow up telephone call".

28. Select from the three sources below the bands that you believe most closely represent the constituent components of the sources of revenue finance used by your STP for providing knowledge-based SMEs and start-up companies with professional business support, training, technology transfer or access to finance services over the period 2000 – 2012.
    The logic for this question must limit the responder to insert only numeric data and the sum of the entries at a., b., and c. must equal 100.
    a. ERDF and ESF (%) choice from 1 of 6 radio buttons
    b. Other Public sector sources (Local and national governments, regional development authorities, universities, other publically funded research organisations etc.) choice from 1 of 6 radio buttons
    c. Private Sector sources (e.g. STP's own resources, bank borrowing, staff time and financial support from private companies, income from the client companies) choice from 1 of 6 radio buttons

Thinking now about the value of having ERDF or ESF financial support in the development of your STP's buildings and services:

29. What would you say was the significance of receiving ERDF / ESF in developing your STPs buildings and services (rate importance for building development and development of services separately choosing only one importance factor in each column)::
    Question logic: only two of the following 10 radio buttons can be selected, one only from each column.

	for STP Buildings	for STP Services
a. Critically Important	radio button	radio button
b. Very Important	radio button	radio button
c. Important	radio button	radio button
d. Useful	radio button	radio button
e. Value was less than the problems caused.	radio button	radio button

30. If your STP had <u>not</u> received any ERDF funding would it:
    a. Have been smaller than it is today? Y/N radio buttons
    If NO go to b. below
    If YES ask: Would it have been (choose one from below):
        i. Significantly smaller radio button
        ii. Modestly smaller radio button
        iii. Slightly smaller radio button
    b. Have developed more slowly? Y/N radio buttons
    If NO go to c. below
    If YES ask: Would it have been (choose one from below)
        i. Significantly slower rate of development radio button
        ii. Modestly slower rate of development radio button
        iii. Slightly slower rate of development radio button
    c. Have been less financially stable? Y/N radio buttons
    If NO go to d. below
    If YES ask: Would it have been (choose one from below)
        i. Significantly less financially stable radio button
        ii. Modestly less financially stable radio button

iii. Slightly less financially stable radio button

d. Have provided fewer services to its clients? Y/N radio buttons

If NO go to heading "Your opinions concerning ERDF" below

If YES ask: Would there have been (choose one from below)

i. Significantly fewer services provided radio button

ii. Modestly fewer services provided radio button

iii. Slightly fewer services provided radio button

Your opinions concerning ERDF

We would now like your opinion on the complexities of securing and administering ERDF funding as an ERDF user organisation. We have been asked by the DG for Regional and Urban Policy to invite respondents to this survey to provide them with some feedback on the key problems they see in the use of ERDF. Please note - no answers on these topics will be provided to the DG for Regional and Urban Policy other than as aggregated data and under no circumstances will any answer be associated with any individual or any STP.

31. Have you ever experienced any of the following problems in a project which is part funded by ERDF:

a. Losing some part of the funding because an amount claimed was not eligible expenditure when you believed it was? Y/N radio buttons

b. Losing funding because your calculations of organisational overhead cost were contested. Y/N radio buttons

c. Losing funding for breaking any of following rules

i. Not properly signing a building with the right ERDF wording and EC logo Y/N radio buttons

ii. Not carrying the EC logo and required wording an all project documents Y/N radio buttons

iii. Not including the required attribution to the ERDF programme in all project based PR material. Y/N radio buttons

iv. Not adequately promoting the project Y/N radio buttons

d. Suffered cash flow problems because you could not claim a grant instalment until you had fully defrayed the relevant expenditure by evidencing that the money had gone from your bank account. Y/N radio buttons

e. Suffered a claw back of ERDF of funds because:

i. Some or all of a building intended for use by SMEs was in part being used by non-SMEs Y/N radio buttons

ii. The procurement mechanisms used in a project had not fully complied with EC procurement regulations Y/N radio buttons

iii. The outputs generated by the project had fallen short of those listed in the grant offer Y/N radio buttons

iv. Suffered a de-commitment of funds because the project had taken longer than expected and therefore spent at a rate below the profile in the grant offer. Y/N radio buttons

f. Suffered significant problems at the proposal stage because of State Aid issues Y/N radio buttons

32. Please provide any other feedback you would like to make concerning the use of ERDF funds for assisting the development of STPs <Box for data, allow up to 500 words>

Display message: “Thank you for undertaking the survey”. Then send an “ERDF questionnaire completed” message fully completed questionnaires. If not fully completed up to this point then display the reminder “Your survey questionnaire is not fully complete. You may complete your questionnaire now or save it and return later”.

NB: Questions 32 – 35 are not relevant to the above group of companies so must not be counted when displaying the “incomplete questionnaire” message.

Part 3b – Developing and Financing Your STP (for STPs who believe they were not in an EU region or Member State where they believed they could bid for or receive ERDF funding)[55]

Capital Projects (Building works)

33. This next part of the survey is seeking approximate information on capital for buildings and revenue expenditure on services designed to assist the STP's client companies. First, please provide the information requested on floor areas of buildings created or refurbished in the period 2000 – 2012. What was:
    a. The approximate gross area (total area of all the floors in buildings) for new buildings developed on the STP over the period 2000 – 2012. <Box for data> m^2
    b. The approximate gross area (total area of all the floors in buildings) for buildings undergoing a major refurbishment or a landlord financed fit-out to meet tenant needs over the period 2000 – 2012. <Box for data> m^2

34. What were the approximate capital costs for all new buildings and major refurbishments or fit outs completed over the period 2000 – 2012. Select one of the following 9 ranges.
    Question logic: only allow one of the following 9 radio buttons to be checked
    a. €0 radio button
    b. <€2m radio button
    c. €3m – €5m radio button
    d. €6m - €10m radio button
    e. €11 - €20m radio button
    f. €21 - €40m radio button
    g. €41 - €80m radio button
    h. €81 - €100m radio button
    i. >€100m radio button

    If more than €100m selected send message to IASP "high capital expenditure STP consider phoning to check validity and securing more details"

35. What were the sources of funds for your capital building programme in the 2000 – 2012 period? Please complete the following table selecting one radio button on each row of the following table:
    The logic for this question must limit the responder to insert only numeric data and the sum of the entries at a., b., must equal 100.

    a. Public sector sources e.g. local and national governments, regional development authorities, universities or other publically funded research organisations (%)
    <data box>

[55] Ibid ref 53

b. Private Sector sources e.g. companies constructing their own buildings on the STP, private sector property developers, the STP's own resources including Bank lending (%) <data box>

Revenue Projects for services supplied to SMEs by the STP organisation

36. What was the approximate total revenue expenditure in the period 2000 - 2012 on activities operated by the STP organisation delivering services, business support, technology transfer and access to finance (including any grant, loan or investment funds) targeted on knowledge based start-ups and SMEs. Select one of the following 8 ranges
    Question logic: only allow one of the following 7 radio buttons to be checked

    a. €0 radio button
    b. <€1m radio button
    c. €1m - €2m radio button
    d. €3m - €5m radio button
    e. €6m - €10m radio button
    f. €11m - €20m radio button
    g. €21 - €40m radio button
    h. €41 - €80m radio button
    i. >€80m radio button

    If >€80m selected send message to IASP "high revenue expenditure STP alert - consider phoning to check validity and securing more details"

37. What were the sources of the funding for the above projects in the 2000- 2012 period? Please complete the following table selecting one radio button on each row of the following table:
    The logic for this question must limit the responder to insert only numeric data and the sum of the entries at a., b., must equal 100.

    a. Public sector sources e.g. local and national governments, regional development authorities, universities and other publically funded research organisations, etc. (%) 6 radio buttons
    b. Private Sector sources e.g. the companies benefitting from the services, the STP's own resources, Banks and other companies providing resources, both people and money etc (%) 6 radio buttons

    Display the message: "Thank you for undertaking the survey". Then send a "non ERDF questionnaire completed" message for fully completed questionnaires. If not fully completed up to this point then display the reminder to the responder: "Your survey questionnaire is not fully complete. You may complete your questionnaire now or save it and return later".

    NB: Questions 21 to 30 are not relevant to this group of STPs so should not be counted when the logic for displaying the "incomplete questionnaire" is programmed.

Annex 1.1 A schedule showing the frequency with which some of the more common STP services are provided at EU STPs

STP Services	Percentage of EU STPs
Professional Business Support & Innovation Services	
Accounting, legal, and related services	62.9%
Own venture or seed capital funds	32.2%
Assistance with other venture/seed capital funds	77.4%
Business development / Support services	79%
IP consultancy. Patent attorneys. etc.	66.1%
Development of resident organisations	41.9%
Management support services (consultancy. etc.)	75.8%
Networking (external)	83.9%
Networking (internal)	85.5%
Training courses	61.3%
Property related services	
Lab facilities / Lab equipment for rent	58.1%
Auditorium / Conference room	91.9%
Meeting rooms	93.5%
Security surveillance (24 hr.)	66.1%
Security surveillance(only during working hours)	16%
Electronic security systems in common areas	74.2%
Electronic security systems for single buildings	61.3%
Videoconference room	54.8%
General common services	
Secretarial services	43.5%
Event planning	59.7%
Marketing & Promotions	56.4%
Public / Investor relations	62.9%
Bank office / Banking services	37.1%
Travel agency	16.1%
Assistance with corporate relocation	29%
Social and recreational services	
Kindergarten	27.4%
Medical services	30.6%
Cafeteria	91.9%
Hotel	17.7%
Restaurant	62.9%
Catering	79%
Shops / mall etc	12.9%
Sport facilities	40.3%
Golfing facilities(in the park or within 10 km)	25.8%
Public transportation	61.1%
Residential area (houses, apartments, etc.)	12.9%
Other	4.8%

Source IASP 2012

Annex 1.2 The principal technologies supported on EU STPs

Sectors	Percentage found in STPs
Computer / Informatics	87.1%
Biotechnology / Life Sciences	83.9%
IT / Telecommunication	82.3%
Internet Technologies & Services	80.6%
Energy Technology	75.8%
Software	74.2%
Design / Engineering services	69.4%
Medical Technology	67.7%
Environmental Technology	66.1%
Education	56.5%
Industrial Electronics	51.6%
Chemistry	48.4%
Nanotechnology	46.8%
Pharmaceuticals	46.8%
New Materials	45.2%
Agro-food / Agriculture	41.9%
Value-added Services	40.3%
Industrial / Manufacturing Systems	40.3%
Food Technology	38.7%
Consumer Electronics	35.5%
Pure Research	29%
Aeronautics / Aerospace	27.8%
Optics	19.4%
Trade Services	14.5%
Other	13.1%
Tourism Services	12.9%
Forest Technology	12.9%
Off-shore Technology	11.3%
Sports Technology	8.1%

Source IASP 2012

Annex 2.1 Definitions of STPs

The following are the publically promoted definitions of STPs from four European STP Associations

APTE (Spain) STP definition

It is a Project, generally associated with a physical space, with the following characteristics:

- Formal and operational dealings with universities, research centres and higher educational institutions.
- Designed to encourage the creation and growth of knowledge – based companies and other organizations belonging to the service sector, which are normally established in the park itself, with a high added value.
- A stable managing body that promotes the transfer of technology and fosters innovation between the companies and organizations using the park.

UKSPA (UK) STP definition

A Science Park is a business support and technology transfer initiative that:

- Encourages and supports the start-up and incubation of innovation-led, high-growth, knowledge-based businesses.
- Provides an environment where larger and international businesses can develop specific and close interactions with a particular centre of knowledge creation for their mutual benefit.
- Has formal and operational links with centres of knowledge creation such as universities, higher education institutes and research organisations.

SISP (Sweden) STP definition

Science parks are stimulating and rewarding environments that offer a knowledge-intensive growth infrastructure, networking and business development. A science park can be described as a meeting between people, ideas, knowledge and creativity and is often a platform for greater innovation and development.

TEKEL (Finland) STP definition

TEKEL network represents the structure of space and technology service operations at world class levels and expertise. Technology centres are regional and international attraction factors and act internationally as attractive investment targets. Toimialaerikoistuneet centres operate effectively in technology and competence-based cluster function and the development of the implementation environment.

Annex 2.2 Case studies from well-known international parks illustrating generational issues

The following paragraphs outline the key facets of the Sophia Antipolis Technopole, Research Triangle Park and two Cambridge Science Parks, focussing on some of the key elements that are helpful to understanding the opportunity and mission for CSITP.

Sophia Antipolis - France

Based on ideas generated and promoted by Senator Pierre Lafitte in 1960, first the French minister Jean-Marcel **Jeanneney** and then five local authorities all worked together to bring about the Technopole project. Under the five original communes (Antibes, Biot, Mougins, Valbonne and Vallauris), the Alpes-Maritimes Local Council and the French Riviera Chamber of Commerce and DATAR (the then newly created agency for regional policy) were enjoined. The project received official recognition through the Interministerial Committee for Land Development in April 1972, led by a joint syndicate developer, in 1974, under the name of SYMIVAL (which later became SYMISA.) In 1974 SYMIVAL delegated the operational activities of Sophia Antipolis to the French Riviera Chamber of Commerce. The land dedicated to the Park is 2,400 hectares but Sophia Antipolis has maintained a policy that 2/3rd of all land brought into development must remain “green”.

There are essentially two governing bodies that oversee the technopole's activities. The SYMISA (Syndicate of Sophia Antipolis) has 44 members who are responsible for general management, financial policy, promotion and services to companies. One of the major functions of the SYMISA is to decide whether to approve an application for technopole residency. In making this decision, the SYMISA considers the following four factors:

- The technological nature of the activity
- The absence of pollution or other nuisance factors
- The type and number of jobs created
- The proportion of surface area occupied to the number and type of jobs created.

A second body, the SAEM Sophia Antipolis Côte D'Azur, acts as the authorized agent for SYMISA and governing body. Functions of the SAEM Sophia Antipolis Cote D'Azur include negotiating the initial land sale or lease contract and assisting a company in obtaining government permits.

The early development of the Park concentrated on attracting multinational technology businesses and French public sector Higher Education and Research organisation. Then from the mid-1980s onwards the infrastructure of the Park deepened first with the establishment of INRIA (the National Institute of Computer Research and Automation). INRIA founded at Sophia Antipolis brings together 29 research teams, of which 8 work in partnership with universities, institutes and research laboratories. INRIA operates a proactive policy in the area of technology transfer. The result of this can be seen, for example, through the starting up of technology companies and their technology dissemination programmes.

Then in 1984, the "Foundation Sophia-Antipolis" was created as a public utility to stimulate innovation by organising events and activities of benefit to occupiers of the Park. In 2004 the Foundation Sophia-Antipolis modified its status to become a "Foundation for sheltering research", which enables it to create research foundations around research projects. These "sheltered foundations" encourage public/private partnership for the funding of research. Today the ongoing Foundation programme of events and activities is extensive covering the themes of research, innovation and small business development.

In 2001, the first business incubator and business support programme PACA-Est and Club Sophia Start-up respectively became operational and more recently the Institute Eurecom and Sophia Eurolab added a technology improvement programme and seed fund activity respectively to support the business creation activities on the Park. All supported by the public sector. Today there are also several private sector business centres including a World Trade Centre and a Regus serving the needs of the smaller international operations attracted to Sophia Antipolis.

The work of the Foundation since 2004 and the extensive incubation capability developed over the last decade has brought Sophia Antipolis into the 3rd generation category of STP.

Finally, it is worth noting that the original parties, their successors and new members enjoined to create the Park, both private and public, have bound themselves to a series of principles as to the way that the Park will be developed both to foster economic development and to protect the environment.

Research Triangle Park (RTP) in North Carolina, USA

Research Triangle Park (RTP) is believed to be the oldest example of a Science Park in the developed world. It's achievements in transforming the economy of North Carolina and its scale, make it one of the most impressive.

What follows are some extracts from a paper by Rick Weddle, on the history of the Park. Prior to his current position at the Metro Orlando Economic Development Commission (Florida) he was President and CEO of the Research Triangle Foundation of North Carolina which is the owner and developer of the Research Triangle Park.

The idea for RTP stemmed from the need to reverse a number of adverse economic trends facing the North Carolina economy. In the mid-1950s, North Carolina's per capita income was one of the lowest in the USA due to the fact that the state's economy was dominated by low-wage manufacturing industries such as furniture, textiles, forestry, and small-scale agriculture. The state was facing a serious "brain drain" as graduates in the state were leaving in search of better jobs, and those attending college outside the state were not returning.

Upon the urging of some private sector leaders such as Robert Hanes, the president of Wachovia Bank and Trust Company, and Romeo Guest, a Greensboro building contractor, and with the help and support of North Carolina State University Chancellor Carey Bostian, Governor Luther Hodges commissioned a concept report on the idea of the establishment of a research park to diversify the state's economic base. By the end of 1956, the University of North Carolina and Duke University joined the effort and the Research Triangle Development Council was formed. The vision was to

attract research-intensive companies from around the nation to locate in a parcel of land surrounded by the state's research universities.

During the next year, various subcommittees were formed. The groups decided that the Research Triangle project idea was a valid concept and should be undertaken as a private effort with engagement of the three flagship universities rather than as a state/government sponsored venture. The agreed end goal of the partners was to "increase opportunities of the citizens of the state for employment and to increase the per capita income of the citizens of the state."

The RTP Development Council needed to raise the funds to acquire, promote and develop the parcel of land that was to become RTP. The Council achieved this by beginning to assemble parcels of land to make up the Park. An effort led by Romeo Guest optioned 3,430 of the identified 4,000 acres under the name "Pinelands, Inc." For its part, the State of North Carolina played an important role as organizer—both for political support and support and engagement from the universities.

Initial attempts to sell stock locally in the Pinelands proved difficult. In August 1958, Archibald Davis, an executive with Wachovia Bank and Trust, was enlisted to support the effort. Davis recognized that it would be much easier to raise money from corporations and institutions that were interested in serving the state rather than trying to find private investors. As such, Davis began a fundraising campaign on December 1, 1958, and by January 1959 had raised nearly $1.5 million to purchase the first parcels of land. Contributions came from across the entire state.

With the secured contributions the Research Triangle Committee was reorganized as the non-profit Research Triangle Foundation of North Carolina and was charged with developing and managing the Park. In addition to forming the Research Triangle Foundation, the founders set aside $500,000 to establish the Research Triangle Institute (RTI). The purpose of the Institute was to undertake contract research for business, industry and government. It was intended to keep university faculty interested in the Park concept, as well as signal to the corporate community that the Research Triangle leaders had enough faith in the concept to establish the first organization at the Park.

The guidelines for the Park mandated that:

"Eligible occupants of the Research Park be design, research and related operations…or in more general terms, uses that require a high degree of scientific input and which can benefit from a location relationship with the academic community."

While it was decided initially that "no manufacturing or processing enterprises" could be conducted within RTP, the decision was later amended to allow for certain manufacturing.

An important element of the planning of the Park was the commitment to sacrifice a significant amount of the total amount of building space that could be accommodated in order to preserve the natural balance and integrity of the land. The early planners of the Park used the topography, drainage patterns, and vegetation of the land to create an environment with the highest possible physical quality for the researchers' work experience. Development standards and an architectural review board were created to ensure the integrity of the covenants.

The early development of RTP was slow and did not really take off until 1965 when IBM committed to establish a substantial research facility in the Park quickly followed by the Federal National Environmental Health Science Centre. Since then the Park has averaged six new companies and 1,800 employees a year so that today it has some 150 companies and 44,000 employees.

From the creation of RTI onwards RTP has believed in the creation of Institutes involving one or more of its founding Universities with a mission to conduct research and aid innovation in the new technology businesses sectors. For this reason an organisation TUCASI was established in 1974 to stimulate the formation and development of new interdisciplinary Institutes. A 120 acre plot was set aside for future Institutes. Today, the TUCASI campus is home to the National Humanities Center, the Microelectronics Center of North Carolina, the North Carolina Biotechnology Center, the National Institute of Statistical Sciences and the Burroughs Wellcome Fund. The First Flight Venture Centre - a technology incubator is also located on this site. The innovations, spin-out activity and new business derived from the work of these Institutes makes for an impressive role call along with a Nobel prize winner and US Presidential and National Foundation Awards. Some of the Institutes themselves have developed international reputation that attracts high-level talent to RTP. The high level of collaboration activity between the research base and industry undoubtedly brings RTP into the 3rd generation status

The cumulative effect of the Park over the last 50 years has been to transform the region and the state. This impact has resulted in a change in the composition of the region's industries, an upgrading of the capacities at the three flagship universities—as well as all institutes of education throughout the region and state, and to create one of the leading areas for high-technology innovation in the USA. As a direct consequence North Carolina is now in the top 10% of the per capita incomes in the US States.

Two Cambridge Science Parks – The Cambridge Science Park and St John's Innovation Park

The Cambridge Science Park was the brainchild of John Bradfield the Bursar of Trinity College Cambridge as a response to a report by the Mott Committee, a special Cambridge University Committee set up under the Chairmanship of Sir Nevill Mott (then Cavendish Professor of Experimental Physics) to consider an appropriate response from Cambridge to an initiative of the Labour government following its election in 1964. Whitehall had urged UK universities to expand their contact with industry with the objective of technology transfer and also to increase the payback from investment in basic research and an expansion in higher education, in the form of new technologies.

The minutes of the public meeting Chaired by John Bradfield that was held to convince other local stakeholders and luminaries of the merits of the idea, show that Trinity were indeed seeking to use property as a means for anchoring knowledge based businesses close to the University in order to facilitate technology transfer. This was carried through in the terms of the planning consent given on the land, which was then enshrined in the leasehold agreements signed by all tenants.

The Park became operational in 1972 but was slow to develop until the mid-1980s when Napp Laboratories constructed their iconic labs and production facilities there and the IT sector started to burgeon as a significant industry in the UK for whom traditional property offerings were not appropriate. This upsurge of technology business was particularly marked around Cambridge with spin-outs emerging in significant numbers from the University, Cambridge Scientific Instruments, Cambridge Consultants and Pye Laboratories. The first wave of spin-outs from these organisations then went on to begat successive generations of new technology based businesses. This became known as the "Cambridge Phenomenon" as documented by SQW.

Cambridge Science Park is based on land owned by Trinity College on which the College has undertaken a number of developments. On other plots developers have been permitted to take an interest in the land and develop properties.

In many ways the Cambridge Science Park was a beneficiary of the "Cambridge Phenomenon" rather than its instigator, although as a flagship initiative it has undoubtedly given a tangible focal point for the phenomenon. It has an innovation centre which is a private for profit project with no in-house professional start-up and early stage business development programmes. Rather it relies on the well-established community of business support and seed funding sources that have clustered in increasing numbers in Cambridge over the last two decades, including the St John's Innovation Park opposite the entrance to the Trinity Park. The Park does however, have a well-developed Park Centre with conferencing, restaurant, café and bar facilities and a separate Fitness and Spa Centre.

St John's Innovation Park was founded by St John's College Cambridge who funded its first and most well-known building, the St John's Innovation Centre and a further five lettable properties as well as an extension to the Innovation Centre which added a restaurant and conference centre. The Centre became operational in 1987 and the first Director of the Centre, Walter Herriot quickly established the Innovation Centre as one of Cambridge's key focal points for knowledge-based enterprise and entrepreneurship. While the Centre accommodates about 65 businesses they work with about 600 businesses each year across the East of England helping entrepreneurs to form, grow and finance their knowledge-based businesses. The Centre also operated an EU Innovation Relay Centre to help foster innovation across the region in existing SMEs. The Centre is well known for its excellent ability to network its clients into the wide variety of individuals and organisations that form the "Cambridge Network" and make the Cambridge the well-recognised UK powerhouse for technology innovation that it has become.

An independent report by SQW in 1997/98 confirmed the highly beneficial effect that the St John's Innovation Park has had in contributing and adding to the "Cambridge Phenomenon" despite its much smaller size than the Cambridge Science Park.

Thus while Cambridge Science Park still project typical 2nd generation characteristics (albeit that it is a larger than average STP for the UK), the St John's Park is more appropriately classed as a 3rd generation project due to the considerable contribution that it makes in building collaboration networks and services to foster knowledge-based business growth across the local and regional economy.

Annex 3.1 EU STP Case Studies exemplifying good practice

Introduction to the EU STP 'good practice' case studies

The STP case studies in this report were not selected at random. Rather, they were selected because each park:

- Was mature – more than 10 years old
- Had a floor area of at least 20,000 m^2
- Had constructed some new buildings during the period 2000 – 2012
- Operated a programme of professional business and innovation support activities that was at least €3 million over the 2000 -2012 period.

The reasons for selecting these criteria were:

- It usually takes up to 10 years for an STP to evolve towards the state where it has a fully experienced management team, a well-developed portfolio of properties and services and has become a fully accepted partner in the local innovation ecosystem
- Only at levels above 20,000 m^2 do most parks start to develop a wide range of property styles and collaboration spaces to meet the needs of the research, SME and corporate sectors.
- That having at least a moderate on-going building programme as a sign that the physical side of the STP is continuing to develop
- A strong professional business and innovation support programme is often a good indicator that an STP is making a significant contribution to reducing weaknesses that exist in the local innovation ecosystem.

In addition, it was felt to be essential that the parks were selected so that there was at least one park from the northern, eastern, southern and western parts of the EU. The selected parks and their criteria statistics are given in Table A5.1.

Table A5.1 The EU STP good practice case studies

Name of Park	Country	Launch Year	Total Floor Area (m^2)	New build during 2000-2012 (m^2)	Expenditure on professional services 2000 – 2012 (€million)
Joensuu Science Park Ltd	Finland	1990	43000	40000	€21M - €40M
Tehnološki Park Ljubljana	Slovenia	1995	65000	60000	€41M - €80M
University of Warwick Science Park	UK	2000	47000	7000	€6M - €10M
Pomeranian Science and Technology Park	Poland	1984	76000	23000	€3M - €5M
Ideon Science Park	Sweden	1983	120000	47000	€11M - €20M
Parque Tecnológico de Andalucía	Spain	1992	422000	35000	€3M - €5M
Softwarepark Hagenberg	Austria	1988	31000	10000	€3M - €5M

These case studies show that STP's are not static organisations - they evolve and develop and this is particularly apparent in the following areas:

- Changes of structure and ownership
- Adjustment of objectives to meet relevant stakeholder policies – five of the case studies have significantly changed or modified their objectives
- Development of the professional services they offer and the breadth of clients served
- The range of property types that the STPs develop or host.

The case studies also demonstrate the wide variety of ownership models and governance structures adopted by EU's STPs but show that some common themes are emerging amongst the professional service portfolios of the exemplar parks. The following Table A5.2 highlights key features of the ownership structures and the professional service portfolios of the case study parks.

Table A5.2 Case study ownership structures and professional services summary

STP	Ownership structure	Professional services
Joenssu Science Park, Finland	Company structure 86% city owned and 9% universities	An extensive range of well-funded services reaching 500 SMEs per year plus long term support for a further 250 making them a key player in the innovation ecosystem in their region. Services cover incubation, product development and innovation, strategy, marketing and internationalisation
Pomeranian Science and Technology Park, Poland	100% city owned with an internal city empowered unit managing the park under devolved mayoral powers.	An expanding portfolio of business support services for new and early stage innovation-led and knowledge based businesses due to an absence of other competent providers, including links to the university, advise services on IP, funding of innovation, business and law, exporting and business incubation and entrepreneur training
Softwarepark-Hagenberg, Austria	'Owned' by a Consortium of regional authority, municipal authority, university and local bank with no formal organisation. Co-managed by a division of the regional authority and a private sector marketing company. The management activity is led and co-ordinated by a respected university professor.	Professional services were considerably boosted in 2004 about 14 years after the park was founded and now operate at the level of c. €3-500,000 per year. Key services include university – industry linking, international incubation (with coaching and consultancy), an investors forum and networking
Ideon Science Park, Sweden	Company structure with university, city and real estate company with the latter as 60% majority shareholder. The real estate company also owns all the land and buildings.	Extensive business incubation with four incubators built in the last 10 years together with an open innovation programme and a growth programme that together now constitute a closely worked and well thought through programme
Technology Park Lubljana, Slovenia	A public-private not for profit company which owns most of the buildings and manages the land. The partners in the company are three national research institutes, a development agency and four companies (bank, pharmaceutical and two ICT).	Has evolved a programme of professional services that are now well structured and themed around: innovation, enterprise, SME growth and networking
University of Warwick Science Park, UK	Now a 100% owned subsidiary company of the university although when formed it was co-owned by the university and three municipal authorities.	Services developed to overcome specific weaknesses in the local innovation ecosystem, particularly with respect to access to finance, marketing and the support of start-up innovation-led businesses through a business incubation system distributed throughout the park's local region
Technology Park Andalucía, Spain	PTA is constituted as a public limited company (Sociedad Anónima) with the Regional government of Andalusia as majority owner with 51% of the share capital, The other owners are: Malaga Council 33%, University of Malaga 1% and Unicaja Bank 15%.	PTA has developed a substantial portfolio of professional services and has increasingly involved the University. PTA's services are mainly provided only to businesses on the STP – but since they are a larger EU STP with nearly 600 on-site clients this represents a significant market potential

Joensuu Science Park Ltd (JSP), Finland

JOENSUU SCIENCE PARK

Joensuu Science Park (JSP) started its existence in 1990 as a project based organization which aimed to provide professional support to growth oriented SMEs. Since the beginning JSP's clients have come from across the region. Property provision started in 1994 in a converted school and has grown steadily over the last two decades to 43,000 m^2. Once ERDF and ESF became available JSP was able to extend professional service offerings.

JSP is host to around 100 companies employing around 1,200 people and to 1000 student in JSP's premises.

Local innovation ecosystem context

(From the perspective of the STP)

JSP is based in the EU F113 NUTs region of North Karelia which was classified by the EU as an Innovation Follower (Medium) in 2011, ranking it at level 5 of 12 on the innovation scoreboard.

The key strengths and weaknesses of this innovation eco-system, as assessed by JSP's management are:

Strengths

- The main organisations of the regional innovation system demonstrate excellent co-operation and have adopted a common development strategy for the region
- There is a strong world level knowledge base in a few sectors, particularly in forestry and photonics sciences
- There is a strong innovation system leadership which has come primarily from the city of Joensuu (city mayor)
- Some regionally and nationally important departments of the University of East Finland (e.g. school of computing) and the Centre for Creative Industries of the Karelia University of Applied Sciences are located inside Science Park
- JSP represents a major pole of strength in supporting the development of knowledge based start-ups and growth oriented SMEs.

Weaknesses

- The region has a small population of about 167 000 and the central city area, Joensuu, accounts for about 120 000
- The area of the region is geographically large (21 585 km^2)
- The number of growth oriented, knowledge intensive SMEs is small being between 250 to 500 in whole region.

JSP's objectives

When JSP was formed its objectives were mainly concerned with technology and research data transfer from university to enterprises. Today the main focus is business development of growth oriented, knowledge intensive SMEs by offering expert services and business environments. Technology transfer is one form of service among other services (see below).

Ownership

Ownership of JSP is dominated by the City of Joensuu (86%) with the University (7%) as the second most significant partner in terms of shareholding. All the owners are either a public or publically owned organisation. Joensuu Science Park Ltd is registered as an independent not-for-profit organization. Therefore, the fundamental motivation of all the owners has been to support regional development by creation of structures that can support the development of growth oriented, knowledge intensive SMEs. The full list of owners is:

- City of Joensuu 86 %
- University of Eastern Finland 7 %
- Finnvera plc. 2 %
- Joensuu University Foundation 2 %
- Regional Council of North Karelia 2 %
- North Karelia Municipal Education and Training Consortium 1 %

Governance and management

As indicated below the Board of Directors is mainly made up from representative members from its owners but also from stakeholders that represent JSP's client companies and local industry:

- Seppo Eskelinen, Executive Director, Member of the Joensuu City Council (Chairman, owner's representative, political member)
- Pia Hiltunen, Controller, North Karelia Municipal Education and Training Consortium (owner's representative)
- RistoJalovaara, CEO, FastROILtd (Represents customers)
- HannuMustakallio, Professor, University of Eastern Finland(owner's representative, political member)
- Jukka Mönkkönen, Academic Rector, University of Eastern Finland (owner's representative)
- Antti Piitulainen, Vice President, Door Control, AbloyOy (Represents local industry)
- Hannu Puhakka, Vice President Middle and Eastern Finland, FinnveraOyj (vice chairman, owner's representative)
- HeleenaUusi-Illikainen, Lecturer, Karelia University of Applied Sciences(owner's representative, political member).

The management team of JSP is led by:

- Jari Lauronen, Managing Director
- Aki Gröhn, Deputy Managing Director
- Ari Immonen, Financial Manager
- Jouko Rautasalo, Development Director.

JSP directly employs about 34 staff members and a further 16 – 17 full time equivalent (FTE) people are contracted. The property and facilities services accounts for 11 direct employees and about 10 FTE contracted people. The professional services delivered by JSP employs directly, at present, 23 staff and indirectly an average of 5 – 6 people FTE.

Strategy

JSP's mission is to develop business life in and around Joensuu by offering high-quality **facility services** and **expert services** that support company growth.

In order to successfully implement its mission, Joensuu Science Park Ltd, must succeed in the following areas: (i) personnel (high quality high skills), (ii) finance (revenue sustainability and strong capital financing), (iii) operational models (viable, innovative and progressive), (iv) operational quality.

Principal strategic directions and choices

The principal strategic directions are:

- The SP's operations target enterprises, the competitiveness of which is based on a high level of expertise
- The SP is regionally responsible for the development of SMEs that are seeking internationalisation and growth
- The SP has a key role in the transfer of expertise between SMEs, institutions of higher education and research institutes
- The SP is responsible for incubator activities of new expertise-intensive companies
- The SP actively operates as a member of the Finnish Science Park Association network.

JSP's principal strategic choices are to ensure that:

- The physical environment remains of a high quality, safe and functional
- The clients experience of JSP's services is regarded as being of a high standard and comprehensive
- The community, made-up of the organisations and people that operate in the facilities, is developed systematically.

Expert Services

JSP's expert services team develop business life in and around Joensuu by:

- Supporting the development of SMEs that are seeking growth and internationalisation in different areas of business
- Promoting cooperation between institutions of higher education, research institutes and enterprises in the regional innovation system
- Implementing projects that develop business life.

Facilities services

JSP's facility services team promotes the creation of new jobs and new wealth in and around Joensuu by:

- Persuading enterprises the operations of which are based on a high level of expertise, to use facilities the SP owns and getting them to commit to their long-term use
- Providing high quality and reasonably priced operations environments that will support the growth and development of its client organisations
- Developing and providing services that will promote innovation, networking and business opportunities for members of the Science Park community.

Premises and facilities

The construction timeline (below) of the Joensuu Science Park (JSP) shows that most of the buildings were created during the period 2000 – 2012. In aggregate, funding over this period has been 40% public sector and 60% private finance and totals between €40M - €80M. The sources of finance have been: bank loans, loans from the City of Joensuu, share issues and state grants. This financing has allowed JSP to become the owner of all its rented properties. However, the land remains in the ownership of the City and JSP rent it from them.

JSP construction timeline

1990: Rented premises (small)
1994: New rented premises (move to Länsikatu 15, Joensuu) (626 m^2)
1998: Purchase of old elementary school within the city (3 800 m^2)
2001: Extension and renewal of premises (Phase 1) (12 000 m^2)
2002: New building (Phase 2) (8 000 m^2, totally 20 000 m^2)
2006: New building (Phase 3A) (5 000 m^2, totally 25 000 m^2)
2008: New building (Phase 3B) (5 000 m^2, totally 30 000 m^2)
2012: Two new buildings (Phases 4A / 4B) (10 000 m^2, total 40 000 m^2)

Professional Services

The expert services provided by Joensuu Science Park Ltd today are:

- Business Incubation
- Situational Analysis
- Business Strategy
- Product development and innovation – provided both through JSP and the national Centre
- Expertise for new products and services located at JSP
- Marketing, sales and communication
- Process management and productivity
- Internationalisation .

All the expert professional services are available to companies outside Joensuu Science Park. However, most are delivered to companies located in the North Karelia region. While JSP provides some services using the expertise of in-house staff, the more substantial business development

activities are provided through external experts working with the management team of the client companies.

In a typical year JSP assists between 300 and 500 SMEs. For about 250 of these companies JSP delivers expertise and support on an ongoing rather than on a project basis resulting in a number of different business development actions in a year.

The typical annual budget of the professional expert services is around €3M. Cumulatively over the last 12 years total expenditure is between €20M – €40M. JSP do not charge their customers for these services. The costs are funded from EU (ERDF, ESF) sources, from different national funds, local municipal authorities, co-operation partners and also from companies. All services are project base financed relying on successful proposals to deliver a specific programme.

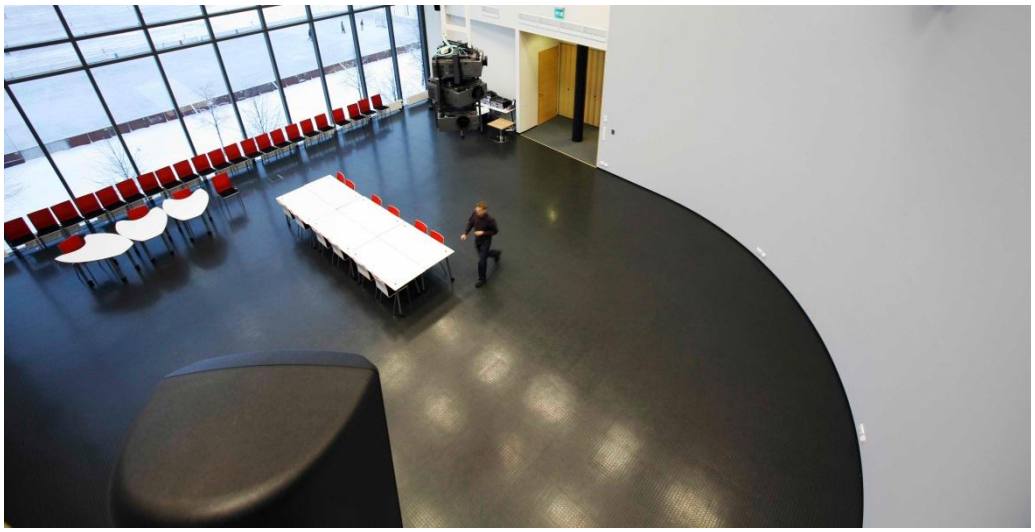
Sustainability

Up to 2006 Joensuu Science Park received annual financial support from the principal owner (the city of Joensuu). After that, JSP no longer required regular external revenue support; however, they continue to receive national financial support for building projects. The construction of a new building tends to depress profitability until occupancy rises in that building to more than cover the costs of operating the building, thereafter normal profitability is restored. This cycle usually takes 1 – 2 years.

Client case example – Blancco Ltd

Blancco Ltd demonstrates both the importance of the property and expert service offerings provided by JSP.

Blancco, a start up at JSP in 1997, has become an internationally significant provider of data erasure and computer reuse solutions with key customers in the defense, police, banking and IT asset reseller markets. Today Blancco has a turnover of about €115 million and approximately 120 employees (2013). The growth of this highly successful IT business has been facilitated by JSP who have provided six different property solution as the company expanded. In addition Blancco has benefitted from the park's incubation services and other JSP expert services. More information at: http://www.blancco.com/us/company-info/history/



Joensuu, Finland – common area space

Pomeranian Science and Technology Park (PSTP), Poland

Pomorski Park Naukowo-Technologiczny

The Pomeranian Science and Technology Park (PSTP) was created in 2001 and opened with its first clients in 2003. PSTP is located in the centre of Gdynia and covers an area of about 6 ha.

The floor area constructed to date is 76,196 m^2, of which 13,483 m^2 of refurbished premises were made operational between 2003 and 2012; total cost of the currently available infrastructure amounts to more than €50 million. This investment was funded 70% by ERDF and 30% from other public sector sources, mainly the city of Gdynia budget.

In October 2013 there were 135 tenants located in PSTP premises, employing 810 staff.

Local innovation ecosystem context

(From the perspective of the STP)

The establishment of PSTP was an initiative of the City of Gdynia, supported by local scientific and business oriented organisations. The Pomeranian region (NUTS PL63) is classified under the EC Innovation Scoreboard system as "Modest Innovation (high)" which is level 10 of 12. The high level of services being developed by PSTP are one of the mechanisms being deployed by the authorities of Pomerania and city of Gydnia to move their innovation ecosystem to a higher level.

Objectives

When PSTP was first formed its main goal was to support companies and enterprises, implementing innovative projects and support entrepreneurship initiatives of students and graduates of regional universities. The main objectives pursued by PSTP were:

- To help in the implementation of high tech projects in the fields of biotechnology, information technology, environmental protection, engineering, and multimedia.
- new jobs opportunities
- Fostering the development of the region of Pomerania.

Today, in addition to the above objectives and goals, which are still in force, PSTP aims to:

- Increase the number and performance of innovative enterprises in the new technology sectors as a means for developing the local economy through a creative partnership between PSTP and local entrepreneurs and existing SMEs.
- Bring into effective use, new premises of about 60,000 m^2 that were completed in April 2013 (office space for rent, laboratory spaces and workshops for prototyping and design development).

Ownership

The land and the buildings are owned by the City of Gdynia and let for the prescribed use by the Gdynia Innovation Centre on the legal basis of Decision no. MG 66/2005 of the Mayor of the City of

Gdynia dated 1 March 2005 and Decision no. MG 211/2008 of the Mayor of the City of Gdynia dated 14 October 2008.

The Pomeranian Science and Technology Park in Gdynia was created in 2001 as an initiative of the City of Gdynia, supported by a group of entrepreneurship enthusiasts, headed by Prof. Anna Janina Podhajska, a prominent scientific researcher at Gdansk University and lecturer at the Intercollegiate Faculty of Biotechnology (University of Gdańsk and Medical University of Gdańsk) (IFB UG- MUG). Until 2004 the main partner involved in developing PSTP was the Association of Pomerania Centre of Technology. The unit became operational in 2003, when the first companies took up space created from an adapted and refurbished local school building. In 2004 the City of Gdynia authorities created a dedicated municipal budgetary unit, named Gdynia Innovation Centre (GCI) and took direct responsibility and management of the Park.

Governance and Management

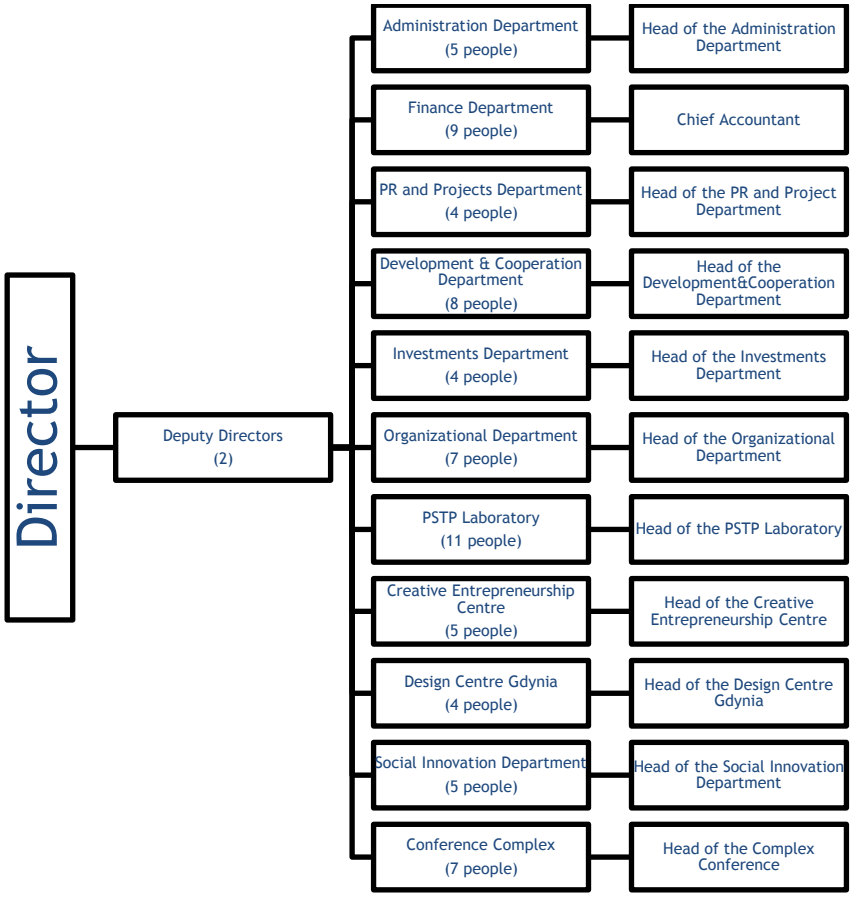
The primary governance structure is the City of Gdynia municipal authority who own PSTP and who created Gdynia Innovation Centre, a budgetary unit within the municipal authority that coordinates the development of PSTP on behalf of the City.

The Gdynia Innovation Centre is headed by Director who represents the unit externally and reports directly into the City authority. The Director manages and coordinates the work of the unit having direct supervisory responsibility for other staff members in the unit with powers devolved from the Mayor of Gdynia on the basis of a power of attorney.

The Director, Deputy Directors and Chief Accountant are the key managers. In the absence of the Director, the Deputy Director takes on the full range of powers and responsibilities of the Director.

Pomeranian Science and Technology Park Buildings, Poland

Figure 1 – Management structure



The management organisation of PSTP is shown above in Figure 1 together with the numbers of staff delivering each of the identified functions of the organisation.

Strategy

Mission

The mission of PSTP is to develop the knowledge-based economy through the creation of effective links between science and business, and to stimulate innovative entrepreneurship in an open partnership environment.

Objective

PSTP is designed to strengthen and concentrate local activities relating to the stimulation of cooperation between science and business as an economic development measure. The function of the park is to contribute to the development of companies in innovative industries by supporting them with favourable spaces, services and knowledge, development opportunities and creative environment.

Tasks

PSTP's task is to create and provide favourable conditions for companies to implement projects based on highly advanced technologies, mainly in the fields of biotechnology and environmental protection, information technology and industrial design.

PSTP is dedicated to the development of entrepreneurship in the Pomeranian region in order to stimulate and restructure the local economy and create new, permanent jobs.

Initiatives implemented by the PSTP and its cooperation with domestic and foreign partners helps the management of PSTP to monitor and follow innovative industry trends and so become better able to respond to the needs of companies, developing and implementing cutting-edge design and technology.

Premises and facilities

The key buildings of PSTP as it stands today, the functions that they fulfil and the historic construction periods are:

1st Building (4900 m²):

The first building involved the refurbishment and modernization of an office building to make it suitable for the needs of the Innovation and Entrepreneurship Incubator (partly adapted in 2003, continued until 2009) with an environment and services designed for the needs for young companies. In this building approximately 420 m^2 of surface was organized and equipped to form Biotechnological Laboratories (The BioLab Centre) (2004 - 2005). The BioLab Centre offers rental space and equipment, space for conducting independent scientific research and space from which Park services are operated for life science based park companies and external institutions and enterprises.

2nd Building (9000 m²):

The second building involved the regeneration of a bus depot for the needs of PSTP in Gdynia (2004 - 2006). The building now contains:

- Modern office, laboratory and prototyping facilities
- Conference & exhibition areas
- Collaboration spaces
- A restaurant

3rd Building (42 000 m²):

The 3rd phase of development of 42,000 m^2 took place from 2009-2012 to facilitate the expansion of PSTP and involved the creation of:

- New offices, laboratories (electronics and biotechnology) and prototyping areas
- Collaboration spaces
- Conference / meeting rooms for 10/15 persons
- A café
- A kindergarten

4th Building (20 000 m^2):

The 4th phase of development running in parallel with phase 3 created:

- A special start-up zone
- A modern conference complex
- Design centre with a modern exhibition area)
- An expanded EXPERYMENT Science Centre
- A Restaurant

Below, in the section on professional services, there is a description of the activities that make use of most of the Phase 4 premises.

Professional services

PSTP's main function is to stimulate innovation oriented economy and provide business incubation for new innovative businesses ideas. PSTP is mandated to focus its main support activities in specific areas of technology, which are: IT and telecommunication technologies, environmental protection, biotechnology, multimedia, design and -since 2009- automation and engineering. PSTP aims to support companies by creating the best possible 'business climate' and packages of free services; the service package for incubated businesses is stronger.

- Modern and low cost office space with a prestigious location and address. The rent price is approx. 30% lower than outside the Park, with an extra 50% discount to young companies (tenants up to 2 years of existence located in areas of Incubation)
- Good telephone/Internet infrastructure, low cost connections,
- Professional space for biotechnology (labs),
- Free or low cost marketing and PR activities eg PSTP's web page and circular publications are used as a professional tool for marketing on the client businesses and PSTP clients are able to use the PSTP logo to strengthen their credibility.
- Attractive, low cost conference and meeting rooms, networking activity and meeting space,
- Regional and international recognition,
- Accessible printing, reception and catering services.

The resources and services above were made available from the outset of PSTP. Each PSTP Partner becomes beneficiary of public aid in the category of 'the minimis'.

New companies (start-ups) are PSTP's main asset and since they are open to numerous risks, the aim is to support them in the best way possible. This thinking led the PSTP management to invite members of the Scientific Council to provide assistance, on request and free of charge, to those start-ups that needed support. The professional 'knowledge based' services are delivered by external experts and made available to the PSTP client companies through a system of free of charge consultation hours, with cost covered by PSTP. Year by year the choice of experts has widened reaching c. 40 experts in the 2011-2012 period covering a very wide range of fields of expertise.

Routine professional services

The routine professional services offered to PSTP occupiers (tenants), PST e-partners (companies without office, with cooperation agreement concerning innovative project), and outside companies are:

1. Providing links to the university and other parts of the knowledge base - a number of cooperation agreements have been signed with academia (PSTP NET agreements); exchange of invitations and information, current cooperation with scientists as members of PSTP Scientific Council (7 persons)

   Delivered to: tenants, e-partners and outside; all f.o.c.
   Provided by: PSTP staff
   Output statistics per year: up to 20 per year

2. Professional advice on intellectual property; seminars and workshops- f.o.c. for tenants (if not agreed otherwise), partly payable for outside companies

   Delivered to: tenants and e-partners(35%) and outside (65%)
   Provided by: PSTP staff in the IP Centre by agreement with Polish Patent Office
   Output statistics per year: 150-200 meetings/mails/phone information

3. Advice on finance to support innovation- f.o.c.

   Delivered to: tenants and e-partners
   Provided by: on demand per agreement with interested VC/Business Angels
   Output statistics per year: 3 meetings / 5 participants

4. Education and training courses- subjects chosen by the tenants, of most interest for majority of interested companies- f.o.c.

   Delivered to: tenants and e-partners
   Provided by: professional operators chosen in public procedure
   Output statistics per year: 3-5 workshops for 15-20 participants in each

5. Consultancy on business and law related issues - f.o.c.

   Delivered to: tenants and e-partners
   Provided by: professional operators chosen in public procedure – c. 40 experts
   Output statistics per year: 400 hours of consultancy (2012)
   Typical annual cost: EUR 8,000- 10, 000 (2012)

6. Start-up support programme, general advice- included in 5.

   Delivered to: tenants – up to 2 years of activity, e-partners up to 2 years
   Provided by: PSTP staff in cooperation with professional consultants (c. 40 experts) and members of PSTP Scientific Council
   Output statistics per year: up to 20 hours of consultancy per start-up; 10 start-ups/year

7. Networking between client companies and with larger organisations to help them establish strategic alliances

   Delivered to: tenants and e-partners
   Provided by: PSTP staff in cooperation with Technology Transfer Centres and PSTP NET Partners
   Output statistics per year: current activity

8. Export support and internationalisation through participation in chosen international and domestic fairs

   Delivered to: tenants and e-partners
   Provided by: PSTP- joint fair stand; costs of stand covered by PSTP
   Output statistics per year: 2-4 events per year with 3-7 participating tenants
   Typical annual cost: CeBit 2013 participation costs: 40 000 EUR
   local fairs participation cost: EUR 5 000

9. Stimulate clustering by helping to grow a cluster and/or improve SME clustering behaviour

   Delivered to: tenants and e-partners
   Provided by: PSTP staff participation in cluster meetings and engagement to support cluster formation; current invitations to join formalised cluster structures, networking

PSTP estimates that the total revenue cost of the above services was between €3million and €5 million over the period 2003 – 2012 with all of these costs being funded by the city of Gdynia.

In addition PSTP is active in developing programmes in the fields of social innovation, creative industry design, science and technology education and youth entrepreneurship

Social Innovation

PSTP is developing "social innovation" programmes and delivering them in collaboration with other organisations. The activities developed up-to-date include: TEDxGdynia, SIX Winter School 2011, the conference cycle "Beginning in the Family", a workshop series – "Design for All", and a conference on "Social Work Specialisation – Challenges of the Near Future". Cooperation with national, European and worldwide organisations and companies through projects help many of the initiatives carried out by this division of PSTP activity.

Creative industry design

The Gdynia Design Centre, located in PSTP premises, supports the development of the creative industries, introducing the companies and projects connected with industrial design, graphic design, multimedia and architecture. The centre also promotes strong relationship between designers and entrepreneurs, coordinates multiple initiatives and happenings related to design in the city, including participation in international projects, conduction of educational initiatives and organisation of exhibitions and happenings promoting design, such as Gdynia Design Days.

Science and technology education

The EXPERYMENT Science Centre, focusing on education, which is located in PSTP premises, is a modern scientific and educational playground based on the "learning through fun" philosophy. The

EXPERYMENT Science Centre which opened on 1st of June 2007 offers children, youths and adults unusual way of spending their free time. User-friendly interactive exhibits grouped into five sections: Environment, Human, Optics, Sounds and Physics add up to form an innovative setting for an interesting school trip or lesson, as well as first rate leisure activity for the whole family. Each exhibit presents the visitor with a unique opportunity to experience and understand everyday phenomena by independently conducting simple, safe and amusing experiments. EXPERYMENT formally separated from the PSTP in 2012 and now has the independent status of a 'cultural unit', enabling it to conduct independent fundraising.

Youth enterprise

PSTP enthusiastically animates and inspires its STARTUP and Co-working scene dedicated to academics and young entrepreneurs. These special, dedicated areas equipped with unique tools, materials and supporting programmes enable users to improve their marked oriented ideas.

Sustainability

It is expected that PSTP will continue as a project of the City of Gdynia, being funded by the city with other public sector interventions, in order that it can continue its work in supporting entrepreneurship and innovative companies; as such it is not expected to achieve income or cash flow breakeven. Gdynia City, does however benefit from the taxes and dues paid by PSTP client companies and the jobs created by the PSTP clients which reduces unemployment benefits thus financially assisting the city.

Client Case Examples

In 2003, when the application to Phare 2003 Social-Economic Cohesion Fund was developed, PSTP proposed the creation dedicated space for biotechnological and pharmaceutical companies. At the time of the proposal (2000-2004) this was novel for the region as no other similar space was available for rent and academics had no chance to start a business of their own from university lab premises. Essentially, the universities had no interest in supporting any independent entrepreneurship coming from their staff and graduates as there were no incentives or resources for this type of activity.

PSTP was able to offer its laboratory spaces and equipment for rent from 2006. 428 m^2 of laboratory space under PSTP management was equipped with sophisticated apparatus and staffed by highly educated biotechnological technicians. Two biotech companies, IMMUNOLAB Ltd. and Cerko, that located to PSTP offices 2003 were able to receive PSTP 'life sciences' dedicated support. Both companies are headed by scientists who share common views on science, education and business.

Case 1 – IMMUNOLAB Ltd

IMMUNOLAB Ltd, manufactures and sells sera for the diagnosis of Salmonella. They took about 200 m^2, furnishing it with their own equipment, and currently employ circa 10people. IMMUNOLAB Ltd. offers more than 60 different kinds of Salmonella antisera and a variety of related products, covering about half of the Polish market

Case 2 - CERKO Ltd

The company CERKO develops, produces and sells dermo-cosmetics for the alleviation of human skin problems. CERKO now sell their products through pharmacies and is prescribed by dermatologists. In 2005 CERKO introduced a new product line named CERKO Lab Systems - a complete set for laboratory analytics. The company started in PSTP with a small lab (12 m^2), small office and warehouse (12 m^2 plus 24 m^2); some services were purchased locally at PSTP. As the company expanded their lab space increased to c. 50 m2 and employment reached 15 professional workers. Other dermatological product lines have been developed so that they now offer 10 products. By 2013 CERKO occupied 60 m2 of office space and 60 m^2 of laboratory space in PSTP.

Softwarepark Hagenberg (SWP), Austria

Softwarepark Hagenberg lies in the Upper Austria NUTS region AT32 which is classed as an Innovation Follower (medium) region on the EU innovation scoreboard.

The park was formed in 1989 and its first tenants were accepted in the following year. The total developed floor area of the park is 30,682 m^2 which accommodates 79 organisations employing 1035 staff.

The park does not have an independent legal basis and relies on cooperation between likeminded stakeholders led (until July 2013) by Professor Bruno Buchberger of the Computer Mathematics faculty of the Johannes Kepler University, Linz.

All governance, management and other organisational matters recorded here are as of July 2013

Local innovation ecosystem context

In the opinion of the Softwarepark Hagenberg the key strengths and weakness of their local innovation eco-system are:

Key strengths:

- The large number of innovative companies, research institutions and educational facilities situated in the region. in particular at
- The Softwarepark, which provides the ideal infrastructure for IT based companies.

Key weaknesses:

- There is an abundance of different organisations and agencies dedicated to enabling knowledge based businesses to grow in the region (by providing professional services, mentoring, funding, grants etc.). Unfortunately, these organizations and agencies tend not to work together efficiently and their structures are often unclear.
- Public transportation and accessibility

Objectives

In 1987, the Government of the Federal State of Upper Austria, with the then Governor Dr. Josef Ratzenböck, financed the renovation of Hagenberg Castle. After the renovation was successfully completed, Governor Ratzenböck asked Bruno Buchberger, a professor of Computer Mathematics at Johannes Kepler University to move his Research Institute for Symbolic Computation (RISC) to the newly renovated castle. It was the Governor's wish that the move of RISC to Hagenberg should also provide an economic stimulus to the economically weak rural region. Buchberger's idea to create the Softwarepark was, and still is, the response to this request. His main objectives have always been the creation of employment, economic prosperity and to bring urban lifestyle to a rural region.

Ownership

Softwarepark Hagenberg was founded in 1987 based on an agreement between:

- The government of the Federal State of Upper Austria (Governor Dr. Josef Ratzenböck) and
- Johannes Kepler University Linz (RISC Institute, Prof. Dr. Bruno Buchberger).

The main partners in the development of Softwarepark Hagenberg are:

- Federal State of Upper Austria
- Johannes Kepler University Linz
- Municipality of Hagenberg
- Raiffeisenlandesbank Oberösterreich AG (local bank, main investor)
- Unternehmensnetzwerk Softwarepark Hagenberg (association of resident companies)

In addition, numerous partners from the public, semi-public and private sectors have played a key role in the development of Softwarepark Hagenberg, in particular the Austrian Federal Ministries, the Upper Austrian branches of the Chamber of Commerce, the Federation of Austrian Industries, and the Chamber of Labour and many others.

The partners mainly became involved in the development of Softwarepark Hagenberg because they wanted to provide an economic stimulus to an economically weak rural region.

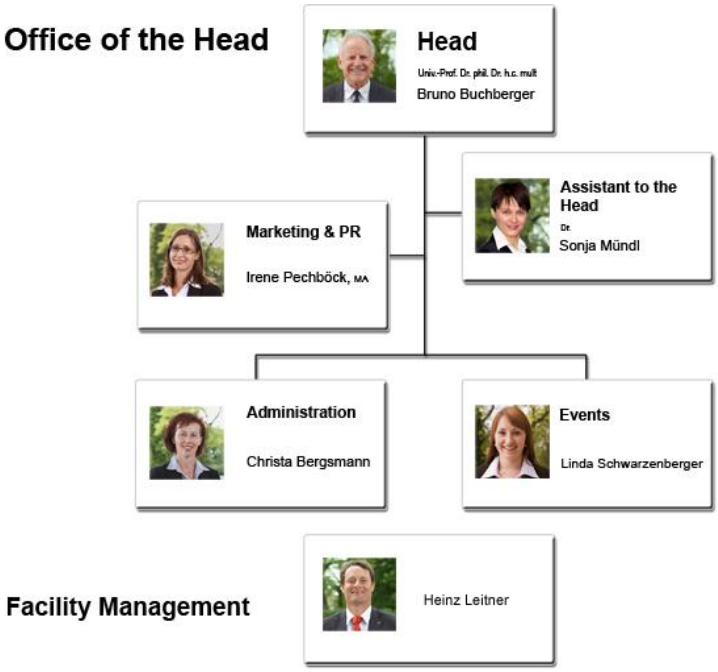
Governance and Management

Softwarepark Hagenberg is managed by a division of the Business Agency of the federal state of Upper Austria called Upper Austria Technology and Marketing Company (OÖ Technologie- und MarketinggesellschaftmbH), which is a limited liability company. Up until the end of July 2013, Bruno Buchberger as a professor of Computer Mathematics of Johannes Kepler University Linz headed the Softwarepark and was in charge of the strategic planning and development of Softwarepark Hagenberg.

There is a written agreement between the main stakeholders (Federal State of Upper Austria, Johannes Kepler University Linz, Municipality of Hagenberg, Raiffeisenlandesbank Oberösterreich AG (local bank, main investor), Unternehmensnetzwerk Softwarepark Hagenberg (association of resident companies)) in which the benefits, rights and obligations of the different stakeholders are outlined.

Softwarepark Hagenberg's Steering Board is comprised of representatives of the main founding partners, i.e.:

- Univ. Prof. Dr. phil. Dr. h.c. mult. Bruno Buchberger (Chairman, founder and Head of Softwarepark Hagenberg)
- DI Bruno Lindorfer (Managing director OÖ. Technologie- und Marketinggesellschaft.m.b.H.)
- Mag. Andrea Reischl (Projectmanager Real-Treuhand Management GmbH)
- Vice rector Univ. Prof. Dr. Gabriele Kotsis (Johannes Kepler University Linz)
- Mayor Mag. Kathrin Kühtreiber, MBA (Municipality of Hagenberg)
- Dr. Klaus Pirklbauer (Unternehmensnetzwerk Softwarepark Hagenberg)



As stated previously, up until the end of July 2013 the organizational chart of Softwarepark Hagenberg looked like depicted above. Professor Bruno Buchberger as Head of the Softwarepark was in charge of the strategic planning and development of Softwarepark Hagenberg as well as General Management of the park. His team consists of the following 5 members:

- 1 Assistant to the Head: responsible for finances, networking, strategic alliances, property management and business support services to the tenants
- 1 Marketing & Press officer: responsible for marketing and press relations, organization of large scale events
- 2 secretaries: in charge of all administrative tasks, the organization of events, meeting and conference room hire, business support services to the tenants
- 1 Facility manager

- 1 staff member is employed by Johannes Kepler University (Professor Buchberger)
- 2 staff members (Assistant to the Head, Marketing & Press officer) are employed by the Upper Austrian Business Agency
- 2 staff members (secretaries) are employed by Schloss Hagenberg Errichtungs- und BetriebsgmbH (part of Realtreuhand Management GmbH, a subsidiary of Raiffeisenlandesbank Oberösterreich AG)
- 1 staff member (facility manager) is employed by Realtreuhand Management GmbH (a subsidiary of Raiffeisenlandesbank Oberösterreich AG)

44 people are employed through sub contracts in providing services for managing and operating the park (partly part-time employees).

All governance, management and other organisational matters recorded here are as of July 2013 (see 'sustainability' below).

Strategy

Numerous projects are being planned in order to turn the Softwarepark into an even more attractive location. An estimated 50 million Euros in the form of private public partnerships will be invested in the settlement of additional IT companies, the expansion of our international network and degree programs for international students, construction of new office buildings and a hotel and the creation of a financing fund for innovative IT start-ups.

Timeline of the Development of the Softwarepark, Hagenberg

	Physical development of key buildings, facilities and professional services at Softwarepark
1989	The research institute RISC moves into the newly renovated Hagenberg Castle. **Softwarepark Hagenberg** is founded by Bruno Buchberger as a spin-off of Johannes Kepler University Linz. Negotiations with Raiffeisenlandesbank Oberösterreich to invest in land in Hagenberg and the **revitalization** of the first office building, the Meierhof.
1990	Professors Wagner and Klement move their JKU research institutes FAW and FLLL to Softwarepark Hagenberg. The first IT companies move into the Meierhof office building.
1993	Bruno Buchberger and colleagues of JKU initiate the University of Applied Sciences in Hagenberg with continuing cooperation in the development of new degree programs. Acquisition of a private investor to build the first dormitory in Hagenberg (Manro House). Agreement with OÖ Studentenwerk to build another dormitory in Hagenberg.
1995	Foundation and outsourcing of RISC Software GmbH by Professor Buchberger.
1997-1998	Establishment and launch of Software Competence Center Hagenberg by professors of JKU.
1999	Construction of the first building of the Upper Austria University of Applied Sciences with funding from the Upper Austrian government. Spatial planning for the Softwarepark and expansion area.
1999-2000	Foundation and pedagogic conception of the Upper Secondary School BORG Hagenberg as an offshoot of Honauer-BORG in Linz.
2000	Lobbying and application for public funding by Professor Buchberger in order to build a sports hall in Hagenberg.
2001	Foundation of Hagenberg Software GmbH by Professor Buchberger.
2002	Construction of the office building IT-Center. Opening of BORG Hagenberg (Upper Secondary School with a focus on Communication Sciences). Development, formation and acquistion of investors for the two buildings "New Center" and "Working and Living".
2004	Construction of the second building of the Upper Austria University of Applied Sciences (UAS) in Hagenberg through public funding.
2006	Construction of the STIWA Group's office building amsec. Construction of the COUNT IT Group's office building. Raiffeisen Bank Region Pregarten constructs the infrastructure centre "New Center". Establishment and application for subsidies for the JKU International Master's Program Hagenberg.
2007	Construction of the building "Working & Living". Creation of the Austrian Grid Development Center which is integrated into the RISC Software GmbH and funded by the Federal Ministry for Science and Research (BMWF).
2008-2009	Formation, coordination and editing of the book "Hagenberg Research" (Springer Berlin Heidelberg). Acquisition of a private investor to build additional student dormitories (Compact Campus).
2009	Development of the International Incubator Hagenberg and acquisition of investment partners (Upper Austrian Federal Government, Raiffeisen Bank Upper Austria). Shuttle bus between Softwarepark Hagenberg and JKU Campus in Linz on an hourly basis created.
2010	Creation and application for subsidies in order to build outdoor recreational courts Founding of the Hagenberg Cloud Computing Association
2010-2011	Joint JKU/UAS Upper Austria PhD Program Informatics by Professor Buchberger and colleagues developed and implemented.
2011	Creation and implementation of the JKU Christian Doppler Lab for Client Centric Cloud Computing in Hagenberg. Development and execution of the International Colocation Center Hagenberg. German software company MSG Systems buys Hagenberg Software GmbH and sets up a branch in Hagenberg. Construction of a third building of the UAS Upper Austria and a public sports hall in Hagenberg with financial support by the Federal Government of Upper Austria. Establishment of a co-working space in the Meierhof office building.
2012	Construction of a second building of the Research Institute for Symbolic Computation (RISC) at Hagenberg Castle (600 m²)
2013	Numerous initiatives to plan the Softwarepark 2.0 introduced. Opening of a Josef Ressel research lab for secure mobile environments (u'smile)

Premises and facilities

The total developed floor area of the park is 30,682 m^2 of which 10,363 m^2 were constructed over the last 12 years at a cost of between €21 and €40m with 43% of the capital being provided by the public sector and 57% by the private sector. The total land area is 200,000 m^2.

The following Table lists the buildings that have been created as the physical infrastructure of the park and identifies what they are used for.

Office premises total	*18,682 m²*
- Hagenberg Castle	1,200 m²
- RISC II	600 m²
- Meierhof	4,319 m²
- IT-Center	2,973 m²
- Neue Mitte	300 m²
- Amsec	6,870 m²
- Count IT	1,500 m²
- Working & Living	920 m²
College premises total	*12,000 m²*
- University of A.S. Building I	2,800 m²
- University of A.S. Building II	5,800 m²
- University of A.S. Building III	3,400 m²
Infrastructure total	
- Dormitory OÖ Studentenwerk	550 beds
- Dormitory Manro - Dormitory Campus Compact - Neue Mitte infrastructure and retail area - Working & Living residential area	50 beds 72 beds 1,100 m² 1,500 m²
Extension area	*100,000 m²*
Total Softwarepark area	*200,000 m²*

Professional services

With the continuous expansion of the Softwarepark from the early 1990s, Professor Buchberger and his team soon realised that the Softwarepark needed to provide special business services to tenants in order to support their settlement and growth at Softwarepark Hagenberg. Professor Buchberger himself took initiative and provided mentoring and coaching services, as well as the linkage to Johannes Kepler University and the local government for infrastructure improvements from the very beginning.

A special professional services programme was not developed until 2004/2005. Since then the programme has gradually been improved, most notably with initiatives such as the International Incubator Hagenberg and the International Colocation Centre Hagenberg in recent years.

The total cost of professional services over the last 12 years lies in the range €3m - €5m with 90% coming from public sector sources and 10% from the private sector. No ERDF was bid for but Framework funds have been used.

International Colocation Center Hagenberg

The International colocation centre was founded in 2011 but is currently on hold due to cuts in public funding.

The International Colocation Center Hagenberg was established as an independent cooperation platform at Softwarepark Hagenberg in order to strengthen cooperation projects between tenant companies and institutions and outside partners (universities, institutions, companies on a domestic and international level). The initiative was based on the Knowledge and Innovation Communities (KICs) Call 2009 for EIT-European Institute of Innovation & Technology.

The service was provided by the Softwarepark Management for both tenant and non-tenant companies. Cooperation projects were coordinated by a staff member of a tenant company (free of charge). The total net costs amounted to €70,000 for a 3-year period. The costs were funded by a public sector grant. In this time, more than 20 new projects and applications for research grants were initiated.

International Incubator Hagenberg

Founded in 2009 but currently on hold due to cuts in public funding

The International Incubator Hagenberg program is an initiative of Softwarepark Hagenberg that is being implemented with the support of the state of Upper Austria and Raiffeisenlandesbank Oberösterreich. It is organisationally established at tech2b (which forms also forms part of Upper Austria's Business Agency). A dedicated incubation manager at tech2b is in charge of providing the service and is assisted by the Head of Softwarepark Hagenberg and his assistant.

The program is primarily designed for domestic and international IT start-ups who intend to establish their headquarters in Upper Austria and wish to settle at Softwarepark Hagenberg in the long run. They benefit from the existing research and educational facilities as well as existing companies on site, the international PhD Programs and the JKU International Master's Program in Informatics at Softwarepark Hagenberg.

The offering includes coaching, consulting and know-how, equity capital investment depending on the respective project, typically up to € 300,000 support in the development of customer relationships, funding assistance for the search, selection, application and processing of additional grants etc. The service is also provided to knowledge based companies outside the park. In a typical year, approximately 20 companies are assisted. 6 companies have so far been successfully incubated and approximately 30 jobs have been created.

The incubator was publicly funded by the State of Upper Austria.

JKU International Master's Program Informatics at Softwarepark Hagenberg

The international Master's Program Informatics at the Softwarepark was initiated by Professor Buchberger in 2006. Every year approximately 25 international students finish their Master's degree in Computer Sciences in this special degree program at the Softwarepark.

The students work together with Austrian IT research institutes and companies in the frame of their masters' theses (in particular with institutes, companies and start-up companies at the Softwarepark), in accordance with the master's thesis subject chosen an individual specialization curriculum is arranged and an individual academic advisor for each of the students is provided.

The students also get a special working techniques and entrepreneurship training and access to the network of the Softwarepark Hagenberg in case they are interested to stay in Austria for further study, working at Austrian companies, starting their own business, etc.,

The service is offered by Johannes Kepler University at the Softwarepark. The program is open to both tenant and non-tenant companies and is financed by public sector grants as well as sponsoring by the IT companies taking part in the program. Every year about 25 companies are assisted and at least 25 jobs (students) are created. No information on the total net costs in a given year is currently available.

Investors Forum

Based on an initiative by Professor Bruno Buchberger, the investor's forum brings together a selection of investors (business angels, banks, investment funds) and IT start-ups. The service is also provided to non-tenant companies. The event is jointly organized by the International Incubator Hagenberg (tech2b) and the Softwarepark Management. Typically approximately 12 companies take place in the Investor's Forum. No information is available on neither the number of jobs created nor the annual net costs.

IN-Breakfast (Information & Breakfast, 3-4 times p.a.)

3-4 times a year, the so-called IN-Breakfasts are organized. CEOs and employees of tenant companies as well as non-tenant companies, representatives of larger organisations and students are invited to meet for a morning session including product presentations and breakfast. The event provides an opportunity to network and to talk about new ideas and possible collaboration with each other.

The event is open for tenant companies as well as outside companies. Typically about 40 organisations and companies participate in the 3-4 events throughout the year. The costs (without personnel) amount to approx. EUR 1,000 p.a. and are financed by the Softwarepark's main budget.

IT-Cluster Upper Austria

A new IT-Cluster was founded in 2012 based on an initiative of the Head of Softwarepark Hagenberg, Professor Buchberger. The new cluster started operations in January 2013. Professor Buchberger and his then assistant (now the manager of the IT-Cluster) were mainly involved in the planning process. The IT-Cluster is based at Softwarepark Hagenberg, but many other IT companies in the whole of Upper Austria have become members in the last 7 months. The IT-Cluster is organisationally established at Clusterland Oberösterreich GmbH, a branch of the Upper Austria Business Agency. The IT-Cluster currently assists 66 member companies. Since the Cluster only

started operations in January this year, no further information with regard to jobs created and net costs is available.

Sustainability

Due to the organisational structure of Softwarepark Hagenberg, the Softwarepark is not sustainable All investments are financed through public-private partnerships, income from rents and property related charges go directly to the property owners (eg Realtreuhand Management GmbH), no service fees are charged to tenants and the management is publicly funded.

Professor Bruno Buchberger, the founder and Head of Softwarepark Hagenberg only recently (August 1, 2013) handed over the leadership of Softwarepark Hagenberg to the Government of Upper Austria and that led to the STP entering a re-structuring process until a successor can take over.

Client Case Examples

RISC Software GmbH – technology and premises support

RISC Software was founded 1992 by Bruno Buchberger as a spin-off of the RISC Institute. For over 20 years the company has evolved and expanded in the number of projects and employees (e.g. year 2000: 6 employees, year 2013: 50 employees).

Situated at the SWP, RISC Software GmbH benefits from having business, research and education on one topic (software) in one single place. Beneath the outstanding regional, national and international reputation of the technology park, it provides a wide range of office and meeting rooms with very high availability and low switching costs which means a high flexibility in constantly meeting changing requirements.

isiQiri interface technologies GmbH – business incubation and premises support

isiQiri is a start-up company that was successfully founded and incubated at Softwarepark Hagenberg (International Incubator Hagenberg Program). The company is dedicated to the 40'' plus segment of the multi-touch market and has meanwhile opened branches in San Jose/California and Tokyo/Japan. The technology isiQiri employs is protected by an ever increasing number of world-wide patents. For further information please visit www.isiQiri.com

Softwarepark Hagenberg's site, Austria

Ideon Science Park (ISP), Sweden

ANYTHING IS POSSIBLE IDEON SCIENCE PARK

Ideon Science Park was formed in 1983 and opened in the same year. It has grown to become one of the larger parks in Europe with a developed floor area of 120,000 sq. m. There are 330 organisations on the site employing 2600 staff.

During the period 2000 – 2012 ISP created 47,000 m^2 of its total floor space and refurbished about 10,000 m^2 of its older properties. This construction was 100% funded by the private sector at a cost of about €90 million.

Local innovation ecosystem context

(From the perspective of the STP)

As measured by the EU Innovation Scoreboard, Ideon Science Park (ISP) lies in an Innovation Leader (high) area in the NUTS 2 South Sweden region. This classification represents level 1 out of 12. This region is part of the well-known Medicon Valley area.

The Science Park management believe that in general the innovation support system in their region is well developed and provides good support for SME start-ups. However, they are concerned that now there seem to be too many players with either too little funding or funding over-focussed on short-term issues.

Objectives

At formation the objective of Ideon Science Park (ISP) was to create new jobs through spin-out companies from Lund University

Today the objectives are articulated as, to:

- Improve growth in the local economy by creating new companies from many different sources leading to new sustainable job creation.
- Transfer technology and research results from Lund University to businesses to develop the image of the university
- Help existing companies to be more innovative by facilitating open innovation processes
- Stimulate entrepreneurship in general

Ownership

Ideon Science Park is owned by:

- Lund University, who were one of the founders
- Wihlborgs Fastigheter - a commercial real estate developer with a vision of the future sympathetic to the mission of ISP
- The City of Lund - who saw the science Park as a generic part of an ambitious city which, it has become.

The legal form of the ownership is through the limited liability company Ideon AB which manages the STP. The shareholdings of the partners are:

- Lund University – 20%
- The City of Lund – 20 %
- Wihlborgs – 60 %

All property is 100 % owned by Wihlborgs, including the land. The company Ideon AB manages and markets the park and provides services to the park's client base, including off-site companies similar in nature to the on-park clients.

Governance and Management

The primary governance structure of ISP is the Board of Ideon AB which is made up of:

- An external Chairman
- One board member from each owner
- The CEO of Ideon AB

The management is headed by a CEO with the following top line reporting managers each with their own staff:

- Director of Finance
- Director of Incubator (operated through a separate subsidiary company of ISP)
    - 4 business developers
    - 1 marketing coordinator
- Director of Services (operated through a separate subsidiary company of ISP)
    - 1 Accountant
    - 4 Receptionists
    - 3 ICT specialists
    - 1 manager of conference services

The CEO's personal office includes:

- 1 Marketing Coordinator
- 1 Project Manager
- 1 PR-consultant
- 1 Business developer

The total staffing of ISP is 22 employed by Ideon AB and its subsidiary incubator and service companies and 7 external contractors.

Strategy

The short-form strategy of Ideon AB is as follows:

The Vision: To make Ideon a Global Innovation Hub

The Mission: To position and operate Ideon as a dynamic arena for creating value by uniting the innovative energies of relevant complementary actors

To secure the mission of ISP Ideon AB designs, develops and operates appropriate offerings, which currently centre on:

- The support of start-ups and SME's with incubation services via **Ideon Innovation** and an Accelerator program via **Ideon Growth**
- The support of existing companies both SME and larger businesses in facilitating open Innovation processes via **Ideon Open**.
- An extended service offering covering
    - IT services
    - Telephony service
    - Reception services
    - Post handling etc

Further information on **Ideon Innovation, Growth and Open** are given below under Professional services.

Premises and facilities

Ideon has 120,000 m^2 of developed building floor space. During the period 2000 – 2012 ISP added 47,000 m^2 (47%) of its total floor area and refurbished about 10,000 m^2 (8%) of its older properties in order to ensure that they continue to marketable to modern requirements and standards. This construction was 100% funded by the private sector at a cost of between €80 million - €100 million.

The latest key project was the construction of Ideon Gateway which opened in January 2013. It added 20 000 m^2 to Ideon and by September 2013 was already is substantially let to client organisations.

Of the total floor space of 120 000 m^2 most is developed to office standard. There are some laboratories and a hotel of 8000 m^2.

Professional services

The programme of professional services operated by Ideon AB has resulted from incremental development over 30 years. Of particular note has been:

- The development over the last ten years of four different incubators. During 2012 these incubators created more than 50 companies. This forms the backbone of the **Ideon Innovation** programme
- The **Ideon Open** service that seeks to facilitate open innovation processes for companies both within and outside ISP's premises. This activity includes assisting with linkages to the university and other parts of the knowledge base, professional advice on intellectual property, advice on finance to support innovation, networking including networking between SME and larger organisations, etc in addition to facilitation services.
- ISP continues to innovate with its services and is currently planning to implement **Ideon Growth** which will helping young knowledge based businesses to grow through mentoring, access to risk finance and other relevant services.

The approximate typical annual net cost of the above services is as follows:

- Ideon Innovation SEK 10M (€1.14 million), which is funded by the national Incubation Program via ALMI, the Real Estate Owner, the City of Lund and Lund University

- Ideon Open 2 MSEK (€0.24 million) funded by the City of Lund and Lund University and Vinnova (Swedish Agency of Innovation)
- Ideon Growth is not yet operational.

Over the period 2000 - 2012 ISP estimate a total expenditure on professional service of €20 – €40 million, of which 30% is funded from private sources, 10% from ERDF and 60% from other public sector sources.

Sustainability

The Kamprad (IKEA) family company Ikano supported Ideon extensively during their first 30 years and this support obviated the need for ERDF funding for the development of premises and helped to ensure an early achievement of financial breakeven which was secured five years after the start of operations in 1989.

IPS has continued to consolidate its financial position and believes that it is sustainable for the foreseeable future.

Client Case Examples

Case Study 1 – property support related

Ericsson, the multinational telecoms company has used Ideon's property services over three decades. Having Ericsson's mobile platform as a part of the science park has been highly beneficial to the development of Ideon, both from the perspective of image enhancement but equally from their role as a buyer of new technologies from start-ups on the Park which has assisted the early stage of product commercialisation of those companies.

Case Study 2 – professional support services related

Ideon Open assisted an existing Company, Inwido, to create a number of new innovations in an open innovations program by running their Idea Generation program with the company followed up with an implementation scheme for the best idea.

Ideon central buildings, Sweden

Technology Park Ljubljana Ltd (TPLj), Slovenia

Technology Park Ljubljana (TPLj) was launched in 1995 and in the following 18 years has grown to become a larger medium scale European STP having 65,000 m^2 of building floor space accommodating 280 organisations that employ 1477 staff. TPLj benefits from being in one of the higher level innovation ecosystems as measured by the EU innovation scoreboard. Nevertheless TPLj has been encouraged by its public sector sponsors to develop and deliver professional services that further boost local SME innovation capabilities.

Local innovation ecosystem context

(From the perspective of the STP)

Technology Park Ljubljana (TPLj) lies in the region of Western Slovenia which is rated on the EU innovation scoreboard as an Innovation Follower (high). This is level 4 on the scale of 1 to 12.

As a result of policies and measures implemented by the state of Slovenia new public and private institutions were established and some existing organisations were tasked to link companies and Public Research Organisations (PROs). The programmes delivered by new and existing organisation involved developing, as well as delivering, supporting services that would implement the national innovation and knowledge and technology transfer agenda. Some of the new organisations created included technological centres, technological parks while universities have been encouraged to establish entrepreneurship and business incubation programmes, support for clusters and other technological networks.

The role of Technology Park Ljubljana (TPLj) within the innovation ecosystem is to be the leading Slovenian institution in the field of new technology based company development. Help to companies is provided through:

- Purpose built office and laboratory space designed to concentrate and synergise specific new technology sectors
- Specifically tailored services with good monitoring and evaluating system.

In addition TPLj's physical and intellectual infrastructure represents an attractive destination for start-up talent. The main persisting weakness in Slovenia in delivering TPLj's mission is the relatively high cost of the physical infrastructure and the high interest rates on bank credit from small companies. These high interest rates are also an obstacle for the development of TPLj.

Objectives

The objectives for TPLj when it was founded were:

- Creating a favourable environment for the development of knowledge based entrepreneurship,
- Promotion of self-employment as a modern trend within society,

- Creating a positive culture for entrepreneurship,
- Assisting potential entrepreneurs with in-depth business information,
- Creating new job opportunities in the region,
- Assisting the diversification of the regional economy with new business categories,
- Assisting enterprises to internationalise their markets through foreign partners and the development of international networks.

Today the objectives followed by TPLj are:

- Stimulating, promoting and evaluating new high-tech business incentives for the incubation programme of the Technology Park Ljubljana,
- Developing, maintaining and retaining a high-tech entrepreneurial potential in the region,
- Promoting an innovative business support environment through the development and delivery of smart support schemes and through the implementation of the modern approaches for business development,
- Providing a contemporary physical infrastructure and business support services to tenants within an affordable price range,
- Strengthening partnerships,
- Organisational growth as a result of providing top quality, successful services,
- Adopting international best practices in the field of business support services.

Ownership

Technology Park Ljubljana was founded in 1995 by the following organisations:

- The national research Institute “Jožef Stefan”,
- National Institute for Chemistry Slovenia,
- National Institute for Biology,
- Technology Development Fund (later Slovene Development Agency),
- The largest Slovene ICT companies IskraTel and Iskra Sistemi,
- Pharmaceutical company LEK,
- SKB bank.

In 2003 the Technology Development Fund left the ownership structure and the Municipal City of Ljubljana joined as a major stakeholder. The founders form a public private partnership with the Municipality and public research institutes from the public sector and regional technology companies from the private sector.

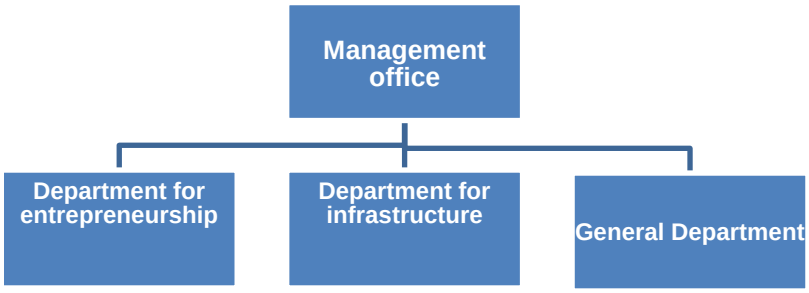
Technology Park Ljubljana is Limited liability private company, governed by public law as a not for profit organisation.

TPLj owns most of the buildings and manages the land. The maintenance of the common areas of the buildings and land are managed by TPLj through a sub-contracted company.

Governance and Management

The governance structure of TPLj is comprised of:

- Board of Stakeholders in which all the founders/owners are represented. They set /confirm the main strategy and investment projects that set the framework for programme of work and activities of TPLj's management
- The General Manager and Deputy General Manager of TPLj are responsible for proposing park strategy to the Board covering property investments and services
- A supervisory board of the organisations with ownership interests has an oversight obligation and has to confirm the decisions that have been reached by the Board of Stakeholders
- A Program Board acts as a consultancy / advisory body to management and stakeholders and has representatives of the university, research institutes, VCs and other experts.



The key management posts are the General Manager and Deputy General Manager.

Technology Park Ljubljana employs nine people and operates some general services such as security, cleaning buildings, janitorial, general light repair and maintenance, grounds maintenance, accountancy and ICT through sub contracted companies involving about a further 14 people.

Strategy

The Vision of TPLj is to become an internationally-recognized support environment and business centre, enabling and promoting global, competitive and innovative technology entrepreneurship.

The mission is to provide a top-quality support environment for innovation led businesses, facilitating the transfer of research findings and innovative business ideas into successful and internationally-competitive technological entrepreneurship.

Premises and facilities

Technology Park Ljubljana's (TPLj) first facility was a 5,000 m^2 of office building dedicated as a technology business incubator. To increase the economic potential of the Park through the growth of its successfully incubated companies TPLj started the development of a "technology zone". By 2008 Technology Park Ljubljana had opened 8 buildings in the zone totalling approximately 33,000 m^2 of office space for knowledge based enterprises which had earlier joined either the incubation or the (go:global) accelerated growth programme (see below under professional services) for further information.

TPLj is following the small-city concept in the development of the "technology zone". In this model all the relevant institutions needed for the full and active support of knowledge based enterprise are present. Effectively, Technology Park Ljubljana is an umbrella organisation which provides on the

spot financial institutions (bank, venture capital investors, venture club, etc.), service providers (vendors, ICT support, accountancy services providers, postal services, etc.), business support service organisations, etc. TPLj strives to achieve and maintain a ratio of 30% of facilities for its incubation programme (for the start-up companies of less than four years) and 70% for the companies which have successfully completed the incubation phase and represent added value to the TPLj innovation community. Additionally, TPLj provides space for a pre-incubation programme (co-working space).

Property Financing

Technology Park Ljubljana applied for a national grant for the development of the "technology zone" and gained €43 million together with €8 million of ERDF funds. Without the ERDF support it would not have been possible to establish the zone. There were some issues in establishing the mechanisms by which the companies could occupy the premises. The initial intention was to sell half of the premises and rent the other half. However, the national ERDF authority advised that this was not allowable under ERDF rules so TPLj took up a 10 year lease and then under-let to the companies. While this was a good solution for the companies, it is more complex and carries greater financial risk for TPLj.

Over the period 2000 – 2012 the total capital expenditure by TPLj totalled between €40 million and €80 million funded 20% from ERDF, 15% from other public sources and 65% from the private sector.

Professional services

From the outset TPLj has provided its tenants with professional business development programmes. These services have changed over time as new concepts and international best practice have been adopted to keep TPLj close to the cutting edge of STP professional service delivery. TPLj develop and improve their services primarily by participating in selected European projects and by transferring best practices in the field of enterprise support with particular reference to securing financial resources for client companies and helping them to gain access to foreign markets.

All services that TPLj offer are available to any company but those not resident on the park have to pay for the services. The services are mainly provided by the TPLj team including specialised services such as hands on support on IPR matters. Approximately 200 companies are assisted in a typical year by this programme resulting in 50-60 jobs being are either created or safeguarded.

The net annual cost of the professional services programme is typically about €400,000 and is funded by TPLj profit, ERDF and national grants.

The principal business and innovation services operated by TPLj are:

Innovation

TPLj have introduced innovation audits as a service to their companies as the result of European project funding. They also have partnership agreements with major institutes and field experts to provide assistance to their companies.

Enterprise

TPLj has a start-up centre which provides a general start-up programme which includes mentoring, general advice and monitoring. With partners, TPLj also organise activities for the promotion of entrepreneurship through a national competition for the Start-up of the Year, iTime acceleration activities, Imagine Cup competitions, etc.

SME Growth

Technology Park Ljubljana operates a “go:global” program which assists their clients to enter foreign markets. The service includes specialist mentoring and advice and involves monitoring the clients’ performance.

Networking

TPLj has networking activities for its companies in order to help them find synergies and strategic alliances with other companies.

Sustainability

TPLj achieved revenue breakeven in 2000, five years after starting operations. Start-up income to support running costs was secured from a government grant in April 1996. Thereafter, TPLj had to bid competitively through public tenders for further grants necessary to achieve breakeven.

A particularly important tranche of start-up funding helping to ensure financial sustainability was the capital grant from the Municipality of Ljubljana with which TPLj were able to purchase the land for the “technology zone”.

Client Case Examples

Case 1 several companies - Property and professional services support

Induktio, BALDER, RACI, XLab, ZOOTFly, Inea, Votan and others are all companies that have begun as start-ups at TPLj with limited financial resources and for whom having affordable premises was crucial for the development of each business venture. Inea and Induktio, are examples of companies that later left the incubator having outgrown units in this building and have moved into the “technology zone” where they continue to benefit from TPLj services including mentoring.

Case 2 XLAB - Professional services support

The company XLAB grew from a small start-up company and today employs 50 staff. At the outset the role of TPLj was to direct and motivate the founder to establish a team, to recruit them and to start planning the business as a global concern. TPLj then provided them with general consultancy on their business idea, helping them to find the right type and provided training on how best to approach foreign markets. XLAB are now the largest Slovene exporters to Japan and have received national and international awards for their business and innovation achievements.

Technology Park Ljubljana, Slovenia

University of Warwick Science Park Limited (UWSP), UK

The University of Warwick Science Park (UWSP) was formed in 1982 and became operational in 1984. It has developed 46,500 m^2 of floor space in a mix of incubators, offices, labs and R&D workshops and collaboration spaces. There are approximately 2200 employees working in the 135 plus companies based in at the Park's premises.

Local innovation eco-system context

(From the perspective of the STP)

UWSP lies in the NUTs region of the West Midlands categorised on the EU Innovation Scoreboard as level 6 of 12.

The primary strengths of the local innovation infrastructure are:

- The University of Warwick with its world class research in manufacturing systems, molecular life sciences and business studies. The Warwick Manufacturing Group (WMG) is particularly noteworthy for its work with business across automotive, aerospace, digital and medical technology sectors
- Coventry University with world class competence in its School of Art and Design with the Design Department specialising in industrial design being particularly relevant to SMEs in the region.
- MIRA the Motor Industry Research Association
- The Gaydon research centre of the Jaguar and Land Rover company
- Stoneleigh Park home of many of the UK's agricultural organisations
- The strong presence of many high performance engineering companies that support the R&D of several international Formula One racing teams and other specialist engineering groups
- A strong IT sector with particular specialisations in computer gaming, education, manufacturing systems and industrial and commercial applications software.

The principal weaknesses in the local infrastructure that the science park attempts to fill are:

- Working with WMG to draw increased number of SMEs into their projects and programmes to complement their strengths in working with larger companies.
- Providing programmes and services that assist small companies and start-ups with good innovative ideas to:
    - Acquire the skills to commercialise their ideas, particularly sales and marketing skills and general mentoring in how to overcome problems as they arise
    - Access the finance to complete product and service development and start commercialisation
    - Soft start-up programmes that minimise risk by ensuring that costs are minimised and advice is continuously available during the pre-revenue years through provision of virtual incubator mentoring and physical incubators

- Developing stronger clustering behaviour in the regional ICT sector, particularly to foster collaborative innovation and commercialisation; this behaviour is historically weak.
- Assisting companies to access the capabilities of either of the above universities.
- Assisting companies to access national support programmes such as those provided by the Manufacturing Advisory Service, Growth Accelerator and the Technology Strategy Board
- Being a champion of the needs of innovation oriented SMEs in all relevant regional forums and committees.

Objectives

In 1982 the founding partners intended that the Science Park should build upon the joint strengths of a well-established scientific community and a skilled workforce to play an important role in the economy of the West Midlands region. This objective was to be met by:

- Facilitating the transfer of University know-how and research into industry
- Offering exceptional accommodation, designed for flexibility and the needs of high-tech companies.

Then circa 1990 the Board added the objective:

- To incorporate high calibre business advisory services for SMEs and early stage companies.

And, since circa 2000 the Board further added:

- Developing additional Innovation Centres to start and sustain the early growth of businesses started by local entrepreneurs across the local region.

Once this latter policy was implemented it became apparent that there was considerable synergy between the additional innovation centres and the business start-up activities within “high calibre business advisory services“ that the Science Park had initiated under the earlier objective.

Ownership

The University of Warwick Science Park is incorporated as a private company limited by shares. The organisations that owned the company from 1982 to 2012 were:

- Coventry City Council (CCC)
- The University of Warwick (UoW)
- Warwickshire County Council (WCC)
- West Midlands County Council (WMCC) - from 1986 this became West Midlands Enterprises (WME)

These partners had a common view of the rationale for the Science Park and were the key enablers in terms of the initial land and finance.

Since Feb 1st 2012 the sole owner of the science park company has been the University of Warwick.

The science park company owns its land via long term leases of 150 years and owns two of its lettable buildings outright and part owns all others jointly with the University as shareholder/ultimate parent. Satellite sites are held via a mixture of joint ventures and management contracts.

Governance and Management

The high level governance structure of the science park is a Board, which since the ownership moved entirely to the University is comprised of:

- The University of Warwick's Vice Chancellor who takes the role of Chairman
- The University's Finance Director
- The University's Registrar
- Pro Vice Chancellor for Research Technology Transfer and Business Engagement
- A University Council member with relevant experience

The Board takes responsibility for agreeing strategy, the rolling annual business plan, annual financial forecasts and for all capital investments.

There is a dedicated CEO and executive management team responsible for the key areas of property operation, finance and business support services. Responsibility for networking, innovation and other business support services to the tenants is shared between the innovation centre managers and the professional business services team.

The executive team comprises:

- Director/CEO (plus Personal Assistant) (staff 2)
- Facilities and Building Manager (staff 1 / contractors 7.5 Full Time Equivalent-FTE)
- Finance & Admin Manager (staff 2.5)
- Innovation Centre Managers (staff 9.4 / contractors 1.5 FTE)
- Business Support Service Executive Officers (staff 5 / contractors as each project requires)
- ICT support (contractors 0.6 FTE)

Total staff 24 plus contractors 9.6 FTE + others as required to deliver business support services.

Strategy

The current strategy of the science park is still under development after the recent acquisition of all shares and assets by the University which removed the local authority stakeholders and thereby reduced the economic regeneration remit, while enhancing the innovation and technology transfer objectives.

Current thinking is that the new strategy would involve further development of its support for SME innovation and knowledge based businesses utilising the Park's portfolio of flexible property configurations, and professional business support services within the University's evolving innovation ecosystem and corporate relations development.

Specific emphases are likely to include:

- High Value Manufacturing companies which predominantly involve design intensive activities around R&D or prototyping

- Using the Science Park's regionally recognised Access to Finance activity, including the Minerva Business Angel network to guide and lead the sub regions support for start-up and early stage businesses.
- Utilising the Science Park's professional business support experience coupled with its networks to promote and support student enterprise and entrepreneurship
- Providing a specific SME engagement route for the University

Premises and facilities

The University of Warwick Science Park has a 42 acre main site, and three smaller satellite sites. The main site has been developed with:

- An incubator / innovation centre of 3345 m^2 designed primarily for start-up and early stage technology based businesses but also used for "first-step" inward investment teams and also for collaborators working with WMG and other parts of the University.
- 8 lettable buildings totalling over 18,000 m^2 designed to take the growth of successful high tech businesses from both the incubator and elsewhere.
- 2 lettable buildings totalling over 5,575 m^2 for single occupancy major technology based organisations.
- 7 owner occupied buildings ranging from 280 m^2 to 3,700 m^2 and totalling over 11,600 m^2.

The Science Park's first satellite site (1995) at the Warwick Technology Park, some 20km to the South of the main site totals 2.5 ha and has a 4,550 m^2 innovation centre for start-up and early stage technology based businesses.

The second satellite site of 1 ha, 17km to the north east of the main site, opened in 2000 providing a further 3,000 m^2 Business Innovation Centre

A third satellite at Blythe Valley Business Park near Solihull, 25km to the West provides 3,100 m^2 and opened in 2001. This is the only building where the Science Park has not contributed a capital investment, though it did provide substantial working capital funds for the first five years.

These developments have been created through a series of mechanisms to produce a situation where the Science Park has control and management responsibility for all lettable buildings and the recruitment and admission of tenants, while at the same time producing a financial profit on its property trading activities.

The principal mechanisms used to finance the building development programme have been:

- Joint ventures with financial institutions
- Joint ventures with Local Authorities
- Joint ventures with Developers and Local Authorities
- Joint venture with Chamber of Commerce
- Joint venture with English Partnerships (a government economic development agency)

- Realisation of capital through long leasehold premium disposals to owner occupiers
- Use of grants available from the European Union (ERDF) and UK Department of Trade and Industry including the Innovation Cluster Fund
- Traditional Bank Finance
- Use of retained earnings.

Most of the lettable building developments on the main and satellite sites have been financed through a combination of the above mechanisms.

Over the period from 2000 – 2012 UWSP constructed 3720 m^2 of office style floor space and refurbished 3900 m^2 of incubator and office space at a total cost of €5million - €10million the funding was 20% ERDF, 10% other public sector and 70% private bank finance raised by the science park.

Professional services

From 1988/89 the Science Park starting delivering a number of 'projects' for:

- Student placements to support innovation
- Developing the clustering behaviour of technology based SMEs
- Improving access to new markets for knowledge based SMEs, particularly within the EU
- Early stage funding of knowledge based businesses

The number of businesses assisted and the intensity of this activity increased year on year until the UWSP's professional services programme was formerly started in 1993/4 with Board approval. This timing reflected the first time that the Science Park had generated sufficient surplus funds to aid the financing of such activities.

UWSP identified that the growth of early stage companies were generally constrained by at least one of three common components:

- Lack of or limited diversity of skills/knowledge – commonly limited by those of the founder
- Weak marketing with a poor understanding of competitor analysis, routes to market, IP etc.
- Difficulty in securing access to finance, particularly for high growth companies that tended to need more capital earlier and hence accessing traditional funding routes were made more difficult by the 'valley of death' effect

Thus, all subsequent professional support projects were generally focussed on one or more of these components where there was clear evidence that the local infrastructure was not providing adequate services. The professional service teams were identified as:

Student and Graduate Placement Projects (Internships)

The scheme was designed to take bright undergraduates into SME businesses during their summer vacation period (ie about 8-12 weeks) to help the host company solve problems associated with the development or implementation of technology or improvement of business processes. The Science

Park operated this activity for about 20 years and placed about 30 students each year. Funding had come from the Shell STEP programme, ERDF, Business Link (the national government's SME service), Chamber of Commerce and Local Authorities.

Over a number of years, subject to funding, a similar scheme was operated for graduates with longer internship periods enabling projects to operate across the whole year.

Technical Marketing - TechMark

The Science Park has a small team of professional international marketing experts, at times assisted by EU students (non UK) via structured programmes or *ad hoc* measures, who take on the task of supporting local knowledge based SMEs to improve their chances of operating successfully in UK, European and wider international markets. The team also provides support to the University, assists networking and provides mentoring services to developing businesses. This activity is branded as TechMark and some 20% of clients employ TechMark's services to access overseas markets.

The use of EU Leonardo business studies students as part of the team has provided a real advantage for companies by offering them native language capabilities. The project typically assists more than 30 businesses a year with in depth support and has a client list totalling over 700 businesses for which assignments have been completed. Over 250 of these clients have been assisted with gaining access to overseas markets. Fostering and supporting innovation is a key aspect of TechMark's delivery.

TechMark also supports the national Manufacturing Advisory Service (MAS) in the West Midlands by assisting manufacturing SME clients of MAS with the sales and marketing aspects of an innovation or diversification project that MAS is assisting the company to carry out.

Over the last five years TechMark has also been a key part of UWSP's inward investment/soft landings program called the "UK Market Access Program".

Access to Risk Finance including Business Angels and Investment Readiness

The Science Park runs a Business Angel Network (Minerva), which has successfully secured over £15 million of risk capital for its client SME companies since 1995. This involves not only the private capital of the Business Angels but additional venture capital syndicated through the intervention of the Science Park. It has become one of the more successful Business Angel networks in the UK for technology based businesses outside London.

The Science Park also has a small seed fund of its own which it started in 2003 with grant funding support from the Regional Development Authority. Realisations since 2009 are providing recycled funds for further investment.

In 2008 the Science Park was awarded a £1 million contract to deliver the regional £5.3 million 'proof of concept' grants project. The project was delivered in conjunction with consortium partners to ensure reach throughout the West Midlands region resulting in 910 enquiries, 220 grants attracting £2.25m of private sector co-investment and creating/safeguarding 295 jobs.

This in-house professional service teams with the core skills and experience described above gives

UWSP considerable flexibility to provide a wide range of support on a responsive basis. For more intensive 'project' delivery work the in-house team can be augmented by part time or full time associates as required. These 'in-house' teams deliver other initiatives by working together or with external partners, as follows:

IGNITE

Since 2006 the main business start-up activity of the Science Park is through the IGNITE program which provides a 'pick and mix' of help from TechMark (usually route to market) and Access to Finance (usually risk finance). This is combined with one-to-one mentoring of pre-start clients who are also eligible for cost assisted space in the dedicated IGNITE incubators (one at each Innovation Centre) for a twelve month period.

This programme handles 8 -15 pre-start/embryonic and about 70 early stage/developing companies annually. Since the program started in March 2006 over 280 jobs have been created/safeguarded, 69 businesses created, 32 businesses attracted to the region and 230 businesses assisted

The initial fit out of the IGNITE incubators (creation of space, provision of services and furniture), loss of rent, service charge and property taxes are borne by the Landlord. The latter is about €30k per incubator per annum.

Delivery is by UWSP staff and is paid for by a grant from the regional development agency of about €150k per annum.

Minerva Business Angel Network

Minerva is an investor network that started as Venture Capital based in 1993 but has been predominantly business angel led over the last 10 years.

The current Minerva model is based on regular monthly syndicate meetings and "pitch" sessions – originally one per month until 2009 but now four per month spread across the West Midlands region. Over the last five years this has generated:-

- £2.52m of investments
- 28 investments
- £11.4m of leveraged investments
- 200+ investor members
- 208 Jobs

The team, all UWSP staff, review 150 propositions and work with about 30 companies per year, a number are too early/not suitably prepared and are referred directly in to the IGNITE program (see separate above).

Over a three year period the program is broadly breakeven – it costs about €120k per annum and generates approximately 70% of its income from success fees. It should be noted that Minerva is a useful source of enquiries for other STP services and has been an important differentiator when bidding for contracts in related areas.

Clusters and SME cluster behaviour

For much of the last 30 years UWSP has helped the growth of the regions ICT cluster and sub cluster in creative media/serious games. In part this has been achieved by becoming a notable pole of attraction with its prestigious premises and in part through the services that the park operates.

The TechMark team have had extensive experience over the years in developing different approaches to support SME clustering behaviour. Currently TechMark is working to create and grow a 'micro cluster' around electric vehicle technology in the local area. This is being undertaken as a speculative self-funded activity and replicates previous successful work done with micro clusters having either sector/technology or geographic cohesion themes.

More recently attention is being paid to the needs of High Value Manufacturing (HVM) and the significant automotive segment generated by Jaguar Land Rover and Aston Martin in the region and the University's Warwick Manufacturing Group adjacent to the Science Park. The recently announced National Automation Innovation Campus (NAIC) will be located at the University but again adjacent to the Science Park.

All of UWSP's professional business support and innovation services are available on identical terms to both park tenants and non-tenants alike provided they meet the profile of being knowledge based start-ups or SMEs with a good potential for growth.

Summary statistics

An overview of the **core** (excluding special projects) UWSP permanent professional services team activity is given below:-

- Typically 300 enquiries per year, about 1/3 result in a substantive engagement.
- Three quarters of companies have 5 or less staff
- One third of companies are established businesses, the remaining two thirds is evenly split across pre-start/ready to start/early stage.
- Over the last three years it has operated at approximately breakeven with only one long term grant (circa €170k) and an annual cost base of about €400k.
- Since 2006, **excluding** any external contracted project delivery, the team has:
    - Handled 1,891 enquires from SMEs
    - Assisted 556 SMEs, 68 extensively
    - Attracted 26 businesses to the region
    - Created 70 businesses
    - Created/safeguarded 292 jobs
    - Brought 20 tenants to UWSP

Over the period from 2000 – 2010 UWSP's net cost of its project activities was between €6 million and €10 million which was financed 40% from ERDF, 40% from other public sector sources and 20% from private sector sources including the project's clients.

Sustainability

UWSP became cash flow breakeven after 4 years of operations and cumulative cash flow breakeven after 6 years.

When the science park was formed the founding partners provided approximately €2.5 million of soft loans at 1% interest with the capital to be repaid only after 30 years. Partners also provided €300,000 of initial working capital by way of equity invested in the company. This funding enabled the science park to acquire its first 10 hectares, pay for access road works and other infrastructure and support the small executive team (2 people until the first building opened). A further round of soft loans from partners was provided 5 years later which enabled a further 8 hectares of land to be acquired and further physical infrastructure completed. It was this soft founding capital that enabled the park to achieve an early cash flow breakeven, attract further rounds of funding for buildings from partners and other parties and thereby secure a longer-term sustainability.

Client Case Examples

Case 1 – Rapide Communications Ltd – property services support

Rapide Communications started as a venture capital backed internet/mobile software company in May 2000.

The new ERDF supported Business Innovation Centre (BIC) at Binley, a satellite of the science park, about 10km away was chosen because of the location, good ICT provision, short-term leases with break options, innovation support and the wide range of business services it could provide. The importance of these property features in supporting the company's planned high growth by allowing them to focus on the core business requirements was recognised by the founder/MD partly as a result of completing 'TeamStart' – a Science Park operated program designed for experienced business people from the corporate sector who were interested in forming their own businesses.

Rapide started in two units totalling 156sqm, a relatively substantial space for start-up and which would have normally attracted a potentially prohibitive cash flow depleting deposit from a traditional commercial landlord. In 2003 a doubling in staff to 28 and additional service provider equipment required an extra 90sqm of office space. The company were referred to the University SME Centre's Business Innovation and Growth programme which included mentoring by one of the Science Park's access to finance staff. The founder received on going advice from the park's mentor for several years, on an as as-required basis, helping with the successive rounds of growth and financing.

In 2006 a management buy-out was performed which drove the next phase of expansion requiring more space than the Innovation Centre could provide. A suitable owner-occupier building was identified on the Science Park's main site. However, the existing broadband connectivity between the two sites as a result of UWSP's partnership with WarwickNET (another tenant company spinout) meant that Rapide's telco equipment could remain located at Binley but operate as though it was at the park's main site. A commercial provider would have had no interest in supporting this solution whereas UWSP were able to not only support Rapide but facilitate further expansion

In 2011 an extension to create an additional 90sqm on the first floor was undertaken to create a customer engagement suite. As Rapide had little experience of project managing a building cost they were supported by the Science Park's buildings and facilities team.

Rapide is now an industry leading Communications and Feedback provider who can boast half of the UK FTSE 100 as users and clients from a base of 40 staff. More company background at: www.rapide.co.uk.

The University of Warwick Science Park's first incubator building, UK

Case 2 – Key Forensic Services Ltd (KFS) - professional services support

KFS, a start-up in early 2005, was formed to be a private sector forensic science service provider. This market had opened as a result of the government de-regulation of such services. The nature of this opportunity required the creation and staffing of regulated and registered laboratories and related facilities before the company was eligible to bid for government tenders. Hence not only was early stage investment critical, but so also were subsequent rounds of investment.

KFS first engaged with the Science Park's professional services team one week after the company was formed and as a result:

- Joined the ERDF supported Investment Readiness program that UWSP's 'in-house' professional services team were delivering, which included the provision of an interim manager and mentor
- Signed up to Minerva, UWSP's Business Angel service
- Initially became a Virtual Tenant which lead on to 500 m^2 of physical space being taken later in the 2005.

From this early start the professional services team have remained engaged ever since, albeit less so over the last year or since the business reached approached breakeven operation, reducing the need for additional investor support.

Over the period 2005 – 2012 the specific professional help from UWSP included:

- The Investment Readiness support mentioned above to raise an initial €120k, provided an interim manager to create the basic business processes and an HR consultant to provide help with the recruitment of key staff.
- Provided mentoring to the sales team in 2007/8
- Via a Business Recovery Service initiative in 2009 established opportunities overseas in emerging markets utilising the core skills of KFS. This work led directly to the first export sales.
- Via the Business Transformation service in 2010 an interim sales manager was provided to develop an action plan and processes to secure private legal defendant contracts as well government prosecution work.
- From 2010 KFS were at a mature enough stage to start evaluating new forensic activities and technologies and hence introductions to the University became effective.

Today KFS provide quality forensic science solutions to the UK criminal justice system and law enforcement agencies worldwide with over 250 staff, 1,800sqm of labs and offices at UWSP and a turnover of about €12m. More company background info is available at: www.keyforensic.co.uk.

Parque Tecnológico de Andalucía S.A. (PTA), Spain

In April 1990 the company "Parque Tecnológico de Andalucía, S.A." was officially constituted, founded by the Malaga Council and two public companies belonging to the Andalusian government in order to promote and manage the technology area. On the 9th of December 1992 the park was inaugurated. Today the PTA has 422,000 m^2 of developed floor space, and 590 occupiers employing 14,700 staff making it one of the larger STPs in the EU.

Innovation ecosystem context

(From the perspective of the STP)

PTA is based in the Modest Innovator (high) region of Andalusia. This is level 10 out of 12 where level 1 is the highest.

Strengths:

- There is an active policy in the region to promote infrastructure development related to parks and technology centres.
- The business development model adopted by PTA combines the creation and consolidation of new companies with the help of different institutions that help to promote entrepreneurial activity with property offerings for established companies that wish to be based in the technology park.
- The ecosystem created in the park generates on average 130 new businesses while approximately 100 businesses leave each year. In this natural mechanism that often occurs in STPs, there is normally at least one valuable company that is created that in the future will become a leading company in the park.
- The existence of multiple knowledge agents in the PTA (University, Technology Centres, public research agencies, etc.), which forms a network of cooperation that contributes to an innovative environment.
- The knowledge based companies in the park have changed the culture of innovation in the region. It has been demonstrated that companies developed in innovative environments perform better and evolve faster than companies developed in other areas.
- The presence of PTA in the Andalusian S&T system is very strong. It is one of the largest Andalusian government assets in focussed on the generation and transfer of technology to the region, as well as a lever for value creation.

Weaknesses

- The most significant weaknesses of the region are the lack of an innovative culture and the excessive fragmentation of business. The low economic growth and technological development of the region depresses innovative culture. These factors are seen as an obstacle to innovation activity and internationalisation.

- Amongst the factors that explain these shortcomings are a number of institutional and cultural socio-economic conditions that traditionally have not been conducive to business development. In this regard it was considered that technology parks could act as a micro-

environment conducive to the creation and development of innovative companies with an international presence.

Objectives

When formed, the Technology Park of Andalusia initially had the following objectives:

- To promote the PTA to stimulate the Andalusian economy via technological development.
- The creation of innovative companies.
- The modernising of existing companies via the use of technology
- To attract foreign technology based companies (FDI)

Currently, the goals of the Park are related to the internationalisation of the Park and also to have a greater interaction with the University. Nowadays the main objectives are the following:

- To maintain a close relationship with the University of Malaga and make the most of their scientific and technological talent to attract it to the park.
- To facilitate the transfer of University know-how and research to park companies.
- The internationalisation of the companies.
- To intensify the cooperation with other networks related to STPs including:
    - IASP, which has been headquartered PTA since 1995,
    - European BIC Network (EBN) – PTA has accommodated the presidency of EBN since 2012
    - Andalusian Technological Spaces Network (RETA), and
    - The Association of Science and Technology Parks of Spain (APTE) which PTA has been a member of since 1998.
- To encourage the creation of international companies and the settlement of international entrepreneurs.

Ownership

PTA is constituted as a public limited company (Sociedad Anónima) with the following organisations holding the shares:

- Regional government of Andalusia 51% of the share capital,
- Malaga Council 33%,
- University of Malaga 1%
- Unicaja Bank 15%.

Governance and Management

Since the majority ownership of the company that manages the Technology Park of Andalusia (PTA S.A.) is the autonomous government of Andalusia, the president of the Park is appointed by that body (Junta de Andalucía).

The Board of Directors is composed of the President, one vice-president and nine board members all drawn from the Andalusian Government, Malaga Council and from Unicaja Bank).

The Technology Park of Andalusia (PTA S.A.) is the owner of the land in the Park with a buildable surface area of approximately 41,000 square metres. It also owns 97,170 square metres used for the extension of the park which was completed in 2012. PTA owns also owns approximately 43,000 square metres of built surface area.
Land and property can be held through the following means:

- Purchasing a plot of land,
- Purchasing rights to a plot of land, with the possibility of acquiring the property of the land if the due requisites are met.
- Rental or purchase of existing office space and industrial units.

Management

There is a dedicated CEO and executive management team who are responsible for property operation, finance and business support services. The professional networking and business services team undertake the networking, innovation and other tenant business support services.

Director – CEO (1 CEO, 1 secretary, 2 assistant directors)

5 areas:

- Marketing management (1 manager)
- Infrastructures and services management (1 assistant manager, 1 technical staff)
- Financial Management (1 manager, 2 technical staff)
- Technology transfer and international relations (1 assistant manager, 1 technical staff)
- Communication, training, projects and networks (1 assistant manager, 2 technical staff)

In 2012, the average number of staff members was 15 (3 directors, 5 assistant managers and 7 technicians and administrative staff), 9 of these being women, and 6 men. All the staff including the CEO are employed by the STP organisation.

The maintenance of the park is managed via the Urban Entity for Conservation and consists of the following services: Garden maintenance, Cleaning, Security, General maintenance and repairs, legal services, other maintenance and conservation expenses. The number of people employed in the companies providing these services is estimated at 25.

Strategy

The Park is developing a strategy for the next 20 years based on three fundamental aspects:

1. The extension of the Park: PTA in the near future plans to increase its land area to 375 hectares, which will extend the capacity of PTA to about 1,500 companies and 50,000 people working on site. Apart from this, in recent years the park has studied the implementation in other parts of the city similar to that carried out on the University campus. The rehabilitation of neighbourhoods in the city of Malaga, the use of the airport grounds or creating enclaves in other parts of the province are new opportunities for the future of the Park as a way to convey the culture of innovation to other settings.

2. Further collaboration with the University of Malaga: Strengthening the exchange of knowledge between companies and University, increasing the presence of the park in the university, building on synergies arising between both knowledge agents. A recent agreement has been signed to launch a

catalogue of services provided jointly by PTA and the University in order to help companies and research groups to collaborate and to generally promote university industry interactions.

3. Being an international park: PTA is seeking to strengthening its international position by attracting international companies and foreign knowledge to PTA, creating an international innovation environment as well as increasing the international presence of local companies and entrepreneurs.

We expect this strategy will allow us to increase our incomes from the sale of land and therefore we will be able to develop new infrastructures to keep expanding the Park while also improving the quality and productivity of the companies in the Technology Park.

Premises and facilities

The key buildings are described below separated into three strategically different periods of PTA's development.

1992-1997

In 1992 Technology Park of Andalusia began operations with 8 companies locating to the park: six were local companies that were hosted in the Business Innovation Centre (BIC), and two companies each located to their own building, one of them was a local company and the other an international business.

During this period 2 grow-on or 'container' buildings were built in the PTA, fully equipped and ready to be used, in order to rent offices out to SMEs interested in establishing themselves in the park.

At the same time a relationship was secured with the University of Malaga to consolidate a network for the diffusion and transfer of technology with the aim to strengthen the transfer of University know-how and research into industry. For this reason the University established a building in the PTA where the Technology Transfer Office (TTO) was accommodated. This centre is also a business incubator for university spin-offs.

1997-2007

From 1997 to the 2007 there was a significant growth in the numbers of companies locating to the park and therefore also in the number of buildings and employees. This period also saw a considerable diversification of the technologies represented by the companies established at PTA. Also in this period entrepreneurs were born who later would grow and expand their facilities from 2007 onwards.

The most important construction projects were the Andalusian Entrepreneurial Development Centre for incubation activities, and also several grow-on buildings for SMEs.

In 1999 the PTA had 126 companies and generated direct employment for 2,312 people. In 2007 the number of companies increased to 478, increasing the number of workers to 13,594.

2007-Present

From 2007 until today, the most significant projects have been:

- The creation of 3 incubators as a result of an increase in the number of entrepreneurs and companies interested in establishing their business in the Technology Park.
- The installation of 4 technology centres

- The construction of a building for large businesses and multinational companies
- An incubator created in the Campus of the University of Malaga, for entrepreneurs and research groups from the University and also for companies that aim to work with the university's scientific and technological knowledge.

Use of buildings

In the PTA a special model has been created that consists of having locations for all types of innovative companies and start-ups: for entrepreneurs (incubators and pre-incubators), small and medium enterprises (containers / grow-on units) and large companies (owner-occupier buildings). With this model TPA has established itself as the leading place for start-ups within the region, which has led to a very positive development in the number of firms and workers in the area.

Pre-incubators

There are two main pre-incubators that provide support services to all types of entrepreneurs, offering information, training, specialised technical assessment, financial advice services, as well as providing locations in industrial units or offices for innovative projects and/or generators of employment. The approximate size of these infrastructures is around 8,000 m^2.

Incubators

There are six incubators for start-up, early stage technology based business and small new companies. These incubators of approximately 17,500 m^2 offer many business services, including financial advice, search for grants, management and marketing training, etc.

Container buildings / grow-on units

The containers / grow-on units are lettable buildings aimed at SMEs. There are several container buildings covering a floor area of over 100,000 square metres. The last building created of this type was completed in 2012. It is a building of 16,800 square metres approx. dedicated to stimulate the innovation and knowledge transfer and to optimise the knowledge resources available from the various companies in the Technology Park, the research groups and centres in the park, attracting international companies to the park.

Technology centres and R&D (Adif, Habitec, Citic, IAT, Bionand, CTAqua)

These centres play an important role as they carry out innovative activities, technological development and transfer of results all orientated to innovation and the strategic economic sectors of Andalusia with highly qualified human resources and developing intense activity which has been increasing in recent years. The evolution of the centres in areas such as employment, turnover and number of employers engaged in them has shown progress in recent years.

The several centres active in the PTA are:

- Rail Transport Technology Centre, which brings together more than 40 national and multinational companies working on projects in this sector.
- Habitec is a centre dedicated to technologies for the construction and edification
- CITIC: Andalusian Center for Information Technology and Communications
- IAT: Andalusian Institute of technology specialized in energy efficiency projects
- The Andalusian Centre for Nanomedicine and Biotechnology, BIONAND
- CTAQUA, dedicated to the efficient management and new technologies related to water

Services Buildings

There are buildings dedicated to services designed to increase the utility and amenity of the park to its client occupiers. These include:

- Two nurseries with more than 80 children,
- A private international high school
- A specialized school of business and marketing with a Masters Programs.
- A sports centre that was inaugurated in September 2013
- A museum, the Centre for Science and Technology, that shows visitors to the park the technologies, processes and products that are being developed in PTA,
- Commercial space including a bank, hotel and more than ten restaurants.

Financing of buildings

The park has financed the above investments from:

- Own resources
- The autonomous government of Andalucía via ERDF funding
- Central government loans and grants.

Most of the lettable buildings and owner occupied buildings as well as the technological equipment have been financed through a combination of the national, regional and ERDF funding. Since its inception, €752 million has been invested in the construction of the park itself, its buildings and equipment and to develop the projects, companies and institutions installed in the park.

The creation and development of the PTA has significantly contributed to the generation of direct, indirect and induced employment and wealth in the local and regional environment. These results would not have been possible without the contribution of the ERDF funding.

Professional services

The portfolio of services offered by the Technology Park of Andalusia to companies in the technological complex has been adapted and configured as the Park has evolved.

In the early years, the PTA began its operations by providing basic services to the enterprises that first moved there, then gradually, based on the demands of the companies that joined the technopolis, the portfolio of services has expanded to adapt to a community of about 600 companies.

Recently an agreement was signed with the University of Malaga in order to provide services jointly with the PTA and the University as can be seen from the following table.

Services	Provided by:	Provided to:
Training programmes	STP company and University of Malaga	Companies installed in the STP, University groups
Internships	STP company and University of Malaga	Companies installed in the STP, University groups
Support for recruitment	STP company and University of Malaga	Companies installed in the STP
Technology Watch assistance	STP company and University of Malaga	Companies installed in the STP
Support for joint research, development and innovation.	STP company and University of Malaga	Companies installed in the STP
Support for access to public and private funding	STP company and University of Malaga	Companies installed in the STP
Boosting business internationalisation	STP company and University of Malaga	Companies installed in the STP
Access to specialized library resources	STP company and University of Malaga	Companies installed in the STP
Promoting the creation of spin –off companies	STP company and University of Malaga	Companies installed in the STP
Support for the establishment of companies in the PTA- UMA environment	STP company and University of Malaga	Companies installed in the STP
Support editing, dissemination and exchange of scientific and technical work	STP company and University of Malaga	Companies installed in the STP
Support editing and dissemination of news generated by the companies.	STP company and University of Malaga	Companies installed in the STP

Approximately 200 companies are assisted each year with these services, which will have played their part in increasing the number of employees in the technology park by 117 new jobs in 2012. In more detail the services are:

Innovation support

The services provided in order to help companies to innovate include:

- Financial advice and seeking funding for R&D projects.
- Internationalisation services, including soft landing and business missions to other countries
- Specific international programs for entrepreneurs
- Assistance to companies through the PTA accelerator
- In addition, firms in the PTA benefit from all agreements and activities organized by the managing body of the park, such as: attending workshops, and training, meetings with other companies and entrepreneurs in the park, meetings and international missions which

facilitate business contacts, and in general benefit from any activity that is organized within the Park.

- Promoting collaborations between companies and the University, the Foundation for Strategic Research and Economic and Social Development of Malaga, the Andalusian Public Foundation for Health and Biomedicine Research in Malaga, and other Technology Centres.

Working with the university

The collaboration with the University is based on the development of a joint strategy between the PTA and the University that allows companies and entrepreneurs in the park to benefit from a range of services including:

- Training
- Support for recruitment
- Support for joint research
- Development and innovation
- Advice on public and private funding
- Boosting business internationalization
- Access to specialized library resources
- Promotion of the creation of spin–offs
- Support for the establishment of companies in the PTA- UMA environment
- Support for dissemination and exchange of scientific and technical work and news generated by the companies

The University is represented in the Technology Park of Andalusia through the University Institutes Building, which is one of the main areas where research and business activities are carried out by university groups. In addition the Bio-innovation Centre of the University of Malaga is also in PTA.

The PTA has been appointed to operate the future Science Park promoted within the University Campus. The PTA will have 74,847 square meters of land in the park extension named “PTA-UMA”, in which the first building was completed in 2013 replicates the PTA business development model. This will contribute to the development of scientific knowledge in close cooperation with the university.

The UNIA (International University of Andalusia) is also based in the PTA.

Start-up and growth

The main services provided by PTA in order to help entrepreneurs to start new knowledge-based business and to support the creation and development of innovative companies are:

- Provision of space with a low rent (small offices, incubation, co-working, etc), first months are free for entrepreneurs
- Financial, administrative and general advice and consultancy
- Support for the preparation of business plans
- Assistance in securing grants and loans specifically for the creation of new knowledge-based businesses by helping the entrepreneurs to prepare the relevant application documents.

- Organising meetings with other companies
- Giving specific training courses for entrepreneurs
- Inviting the entrepreneurs to international entrepreneur missions, workshops etc.
- The 'YUZZ' Program and European program for entrepreneurs: programs with a duration of seven months, which helps entrepreneurs with innovative and technology based ideas around the processes of creating their business plan, assisted by specialized tutors. It also offers entrepreneurs office space in the park for the duration of the program.
- Participation in Spin off programs and in European international training projects.

Networking

The principal networking activities of PTA are:

- Promotion of the development of cooperation projects between SMEs and large companies.
- Informing the companies of the public support available for projects in cooperation.
- Mentorship programme: The managing body of the PTA recently decided to begin a mentorship programme with the aim to help entrepreneurs based in the PTA with their business path via coaching from other more experienced businessmen.
- Organising meetings between small and large companies within the same sector to help them establish strategic alliances

Clustering

PTA has focussed on the creation of five clusters in the technology park, which are:

- Agriculture and food Cluster
- Medical and Biotechnology Cluster
- ICTs Cluster
- Cluster Smart City
- Rail Cluster

PTA collaborates with the growth of clusters and the establishment of SME clustering behaviour through the following activities:

- Search and selection of companies in the province both inside and outside the Park within the same sector in order to make them part of the cluster
- Providing space and infrastructures to grow the cluster
- Organizing meetings between companies to promote the collaboration among them.
- Promoting cooperation projects between companies, and searching for funding to finance the activity of the cluster
- Helping in the definition of the strategy
- Promoting technology transfer and the integration, and strengthening of the companies and institutions that are linked to the same sector.
- Encouraging business cooperation and innovation between the companies that belong to the clusters in order to ensure high competitiveness regionally, nationally and internationally.

- Organising periodical meetings and workshops for companies, enhancing collaboration between them and the follow up of the cluster strategy.

Sustainability

Two distinct periods on the route to sustainability can be clearly distinguished from the results of the park:

The period 1990-1998. In this period the park was developing in an environment of low economic growth and low technological development compounded by an economic crisis all of which made it extremely difficult to bring appropriate projects on reasonable terms to PTA plots. This reality led the PTA in 1995 to begin construction of speculative industrial grow-on buildings / containers, to facilitate the location of SMEs to the Park.

The period 1999-2011. Once a critical mass of projects had located at PTA, the rate at which new opportunities arose multiplied for both already existing buildings (built by the PTA and private developers) and also for plots purchased by companies.

Since 1999 the company has made a profit for 13 consecutive years with an aggregate after tax value of €21 million. The company policy has been to reinvesting those profits back into subsequent additions/expansions made to the park. The net assets of the Company at the end of 2011 amounted to €66 million.

In the last 20 years, the institutional partners have carried out two capital transactions. The first was to compensate for the revenue losses incurred during the early years and the second, more recently, to help the PTA in an ambitious investment plan of about €30 million with a cash contribution of about €8 million.

In late 2011, a study was conducted in order to measure the influence that Andalusia Technology Park has had on the economy at a local and regional level. The study conducted by an international consulting firm concluded that:

- The impact of PTA on the GDP in the local business environment has a value between €1.7 billion and €2.5 billion. The activity generated in the PTA helps to create and maintain an average direct employment of 13,905 persons and indirect employment of between 23,486 and 39,511 jobs.
- The Park's contribution to provincial GDP is between 6.0% and 8.7%. In terms of jobs, it contributes between 7.04% and 10.05% of the working population in the province of Malaga. In the region of Andalusia, the PTA generates between 1.2% and 1.7% of regional GDP and employs between 1.3% and 1.9% of those employed in the region.

Client Case Examples

Case 1 - Ingenia – PTA property services supported company

The company Ingenia moved to the Technology Park of Andalusia in 1992 as one of the 8 initial intakes of companies. Created as a Spin-Off of Fujitsu Spain, Ingenia took up space in PTA's ICT incubator. From the beginning PTA helped Ingenia by providing business and financial advice but also property and renting advice in relation to park accommodation possibilities. Ingenia developed its competencies quickly and won the contract to become the managing organisation for the telecommunications network of the park.

Case 2 – Background to the AT4 WIRELSS case

The Technology Park of Andalusia is involved in monitoring, processing and analysing of calls for project proposals from agencies such as the Ministry of Science and Innovation, the Centre for Industrial Technological Development, IDEA Agency, ENISA and the Ministry of Economy, Innovation, Science and Employment of the Government of Andalusia.

With this type of service provided by the park, such as being a collaborator of Ministry of Economy and Competitiveness in the management of support for infrastructure and equipment in science and technology parks for firms located in them, the PTA has been able to get national and EU funding for Park companies. They are supported at all times by the manager of the park, both in advising on the project application, as well as the filing, monitoring, implementation and project justification. We have many cases of companies that thanks to the support and the services provided by the Park have been able to invest in infrastructure and equipment, and have seen their organizations grow as a result.

AT4 WIRELESS – PTA professional service supported company

AT4 Wireless was the first local company that moved to PTA with its own building. The company offers a laboratory service dedicated to certificate wireless technologies. They were created with a view to break into the international market at an early stage. AT4 wireless has been growing steadily over the years, always accompanied with the help, advice and participation in international business missions organised by PTA and with their help AT4 has obtained public grants and subsidies for R&D, in which the park acted as a partner and intermediary between the company and the public entity.

Around 2003 AT4 wireless expanded its facilities to another building located in the Technology Park, where the company moved its systems division. This division was acquired in 2012 by the American multinational Agilent Technologies, which is also currently located at PTA.

Recent development at the Technology Park of Andalucía, Spain

European Commission

Setting up, Managing and Evaluating EU Science and Technology parks - An advice and guidance report on good practice.

Author: David N E Rowe BSc MBA

Luxembourg: Publications Office of the European Union

2014 – 211 pp. – 21.0 x 29.7 cm

ISBN 978-92-79-37274-2
doi:10.2776/73401

KN-01-14-363-EN-N

Publications Office

ISBN 978-92-79-37274-2