Title City centre and urban edge parks – what lessons can be learnt from each other?

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Executive summary

The comparison of a the Surrey Research Park, which is a university planned and developed traditional science park, and Tech City, which is a unplanned self-generating area in London and has now been recognised and managed as a science park, reveals that many elements of these projects are transferrable but they do both have their shortcomings.

Similarities are that they have both taken more than 20 years to develop but the city centre project has a much narrower range of technologies that drive innovation compared with the diversity of a traditional science park.

The lesson learnt from the review is that by managing these sites they gain momentum so this element of a traditional science and technology parks can be used in self-generating clusters of companies to add value and drive growth.

Abstract

Cities are centres of population growth with 52% of the world's population already living in these conurbations and around 180,000 more people moving into them every day. The challenges this kind of change to society creates for cities is not insignificant with direct impact on housing, transport, energy, food security and access to employment. To deal with these challenges there is a need to accelerate the design and implementation of solutions to the problems of urbanisation if we are to help cities to develop as hospitable living environments.

The Science and Technology Park movement has grown up over the last 60 years with many if not the majority having been established on the edge of towns or in some cases more rural locations and associated with host organisations. However; today the principles behind what makes science parks an international phenomenon are being adopted and adapted to operate in urban locations to try to change their image and reputation, to create high value employment, and have an impact on economic development that includes urban regeneration.

This paper looks at one city based park (Tech City –East London) and one traditional edge of town development (Surrey Research Park) and reviews their impact in terms of their respective objectives, other benefits that they bring to their respective locations and looks to see what lessons they provide for the continual evolution of science and technology parks as a model for economic development and their potential for economic development in cities.

Introduction

The continual current social change of urban drift is continuing to have an impact on the development of cities as centres of population growth with 52% of the world's population already living in these conurbations and around 180,000 more people moving into them every day[1].

These shifts in populations create very significant challenges for city authorities and citizens. These include direct impact on the spatial structure of cities which include housing, and transport, and production structures which support their economic base.

There is a very large and highly technical literature that exists which has come out of the discipline of economic geography that argues that cities work because of the efficiencies which come with the density of the population they support and the benefits of this density in such examples as spreading the cost of infrastructure, the chances of matching buyers and suppliers, linking partners in joint projects or entrepreneurs and financiers[2].

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[1] **Source:** United Nations, Department of Economic and Social Affairs, Population Division: *World Urbanization Prospects, the 2011 Revision*. New York 2012

[2] Duranton G. 2008 Working Paper No12. Cities: engines of growth and prosperity for developing countries? Commission on Growth and Development.
http://siteresources.worldbank.org/EXTPREMNET/Resources/489960-1338997241035/Growth_Commission_Working_Paper_12_Cities_Engines_Growth_Prosperity_Developing_Countries.pdf

The rapid urbanisation that is shifting the majority of the world population from rural areas is increasing the need to develop city based employment

Science and technology parks

Since the science and technology park movement emerged as a distinct kind of highly serviced and supported property development these have become widely adopted instruments for supporting economic development by either helping to lay the foundation of a modern knowledge based economy in developing economies or by strengthening or revitalising regional economies in more developed regions.

Science and Technology Parks include projects associated with universities (Silicon Valley USA and the Cambridge Science Park UK), pre-planned parks on at the edge of cities and towns (Warwick Science Park and Surrey Research Park), parks that are established by taking over redundant or underutilised corporate research facilities in both rural and city locations (Kent Science Park UK and the Nottingham and Scottish Bio-city projects), City Precincts (Silicon Alley in New York, and 22@ Barcelona), and large regional based projects (Cyberjaya in Malaysia which is a town with a science park, Daedeok Science Town in South Korea, and Skolkovo in the Moscow Region of Russia).

Host organisations traditionally have been universities but now include[3] functioning corporate or public research laboratories (Philips Research campus Eindhoven) as well as city authorities that are using policies to support emerging ad-hoc clusters of technology companies (Tech City London).

The range of promoters of these projects also varies with many of those in the early stage of development being put forward by universities as locally driven facilities; however, over time the kind of promoter has widened to include: public authorities. These range from national through regional governments to local authorities. There are also a number of private sector projects with some operating as business accelerators[4].

The range of objectives for the variety of stakeholders include commercialising technology, creating an independent income for a host, creating high value employment which can in some instances include population retention, attracting foreign direct investment to a location, raising the profile of a location or region, establish a focal point for supporting a role of the host in economic development, making a political statement, supporting technology companies by giving them a competitive advantage, helping companies benefit from the output of human and technology resources and creating personal wealth.

Typically stakeholders include the owner of the assets that form the site, the host of the project and tenant companies or firms. Apart from the firms on site these projects can have as the other two stakeholders any number of combinations of owners and investors that include the host, a government if the project is subsidised and the private sector.

Despite this diversity of locations, hosts, funding and objectives for science and technology parks it is possible to see an underlying strategic aim all of these projects is the development of what is now tagged as a modern knowledge based economy or innovation based economy while for the companies that locate on these sites it is the competitive advantage they gain from these locations that is attractive.

Innovation support

It is widely understood that it is business that drives innovation and not government but it is also understood that to support innovation it is necessary to create policies that can target the various elements of the process.

Background research[5] which has looked at over 50 years' worth of research on innovation by the UK government has identified a number of key principles about innovation which are helpful in defining the soft support programmes on science and technology parks.

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[3] https://www.google.co.uk/search?q=third+generation+science+parks&oq=third+generation+science+parks&aqs=chrome.0.57.15683j0&sourceid=chrome&ie=UTF-8

[4] Bound K., and Miller P., The Start Up Factories, NESTA June 2011 - http://www.nesta.org.uk/areas_of_work/economic_growth/economic_programmes/assets/features/the_startup_factories_report_feature

[5] Technology Strategy Board 2013 https://www.innovateuk.org/innovation-research

These findings include:

- It is business not government that drives innovation.
- Innovation is most effective where it is not linear and comes from distributed or community-based models with a number of stakeholders and usually involves collaboration. So it relies on networks and the most effective networks are those that draw in external resources.
- Most innovative change is evolutionary which involves incremental adaptations of existing elements, products and technologies and involves new combinations of existing elements, bodies of knowledge or technology.
- Most large companies are risk averse so they do not try to drive radical innovation because the impact it has is unknowable and they want to protect their existing investment – this is particularly the case in large companies. This means there is an important role for micro and small and medium sized enterprises (SMEs) in driving this process.
- Research has shown that innovation occurs across whole economic systems which means that innovation programmes should not just concentrate on the technology sector.
- Firms vary their emphasis on product and process innovation according to the life-stage of a technology which means there needs to be a variety of support programmes to suit different stages of development.
- Innovation is a 'sticky' activity in which geography matters. Innovation investments and outputs are still concentrated in particular global centres, allowing leading actors to congregate, mingle and compete. This means policy has to work on building this sticky environment.
- Businesses need to build advanced organisational practices to manage the innovation process effectively. Some have two separate groups doing this with one exploring creative, radical new ideas and another for the exploiting and developing incremental improvements in existing ideas.

Many of these features have been recognised by individual science and technology parks that have worked at building ecosystems that match this in terms of their social, business and technology profile.

Surrey Research Park – Guildford UK

The Surrey Research Park is a development that has been undertaken by the University of Surrey on 28.5ha of its own land holdings. This has been developed on a previously undeveloped "green field" site immediately adjacent to the main campus with good public transport links which connect the two sites and link it to the town centre which is two miles distant. The Park lies on the periphery of Guildford as does the University campus. Planned from 1981 the first occupiers moved to the site in 1985.

The development of the Surrey Research Park was based on the grant of development right to the University to allow part of its land holdings which were originally allocated to development as a university campus to be used as commercial development. Land value is very often related to permitted use, permitted density and demand. The latter element was unproven at the time of the grant of planning permission for the Surrey Research Park but once proven then the added value in the land made it possible for the University to raise funding from a land sale and secure a loan against unsold land. This funding provided for the buildings which form the core asset of the Park and for funding the infrastructure of the 28.5 ha site.

The original objectives for the Surrey Park were defined in the context of the three stakeholders that were envisaged for the site. These objectives are still valid today. These include the following:

The objectives for the University were:

- To create an endowment for the University in order to generate some independent income.
- Raising the profile of the University of Surrey as a centre of excellence

- Support knowledge transfer into the commercial domain (innovation).

The objective for tenant companies that were anticipated on the site was:

- To give European centred businesses on the site a competitive advantage.

The objective for the Borough and County Councils which supported the site with the necessary planning permission:

- To encourage regional economic development.

To provide for the conceptual objectives for the site the master plan provides 3 areas of accommodation which when fully built out will offer a gross internal area of 71,500 sq m of built space.

This master plan has proved to stand the test of time and remains valid in the context of meeting the original and still approved objectives of the development of the site. The elements of the plan include an incubator/ innovation centre and grow on space (20% of the planned space offer as units from 19 to 300 sq m), some larger buildings capable of being used as either wet (bio, pharmaceuticals and other chemical company activities) and dry (computer) laboratories (22% of the planned space offering units from 800 to 1600 sq m) and buildings (54% of the planned space from 2,000 to 12,000 sq m) for larger companies.

The Park has been planned, developed, funded (£47m invested by the University) and managed by the University of Surrey which has taken all the risk on the development. In May 2013 the Park had reached 82% developed with 59,254 sq m of gross space that provides a net internal area of 51,979 sq m. Discussions are currently being pursued with the planning authority to extend the site by a further 10 ha on adjoining land.

Records kept since the Surrey Research Park opened in 1985 show that 429 have been has occupation contracts since it opened. Records for May 2013 show that there are 119 firms on the site. The vacancy rate on the site is around 95% with just a few of the smaller units for grown on companies being vacant. This means that 49,380 sq m of space is occupied.

In addition to the 119 contracts in place with occupiers a number of these companies are themselves incubating subsidiary innovation led companies so the estimated number of occupiers on site is around 144 and the pre-incubator has 68 companies registered with them as "members" of which 15 are located on the site and the remaining are virtual companies.

Currently there is around 3,200 staff employed by these companies giving an occupancy rate of 16 sq m per person. Records show that the 310 firms that have left the Research Park since it was opened moved into 67,419 sq m of space in other locations. Using the occupancy rate of 16 sq m per person it is estimated that nearly 4,213 staff were employed at the time these companies relocated which combined amount to 7,413 high value jobs having been created. In a local context 38% of those leaving the Park relocated within the locality which means that in terms of local employment the Park has supported the generation of 1,600 which are no longer on site and 3,200 on site to give a 4,800 high quality jobs in addition to the 2,600 additional jobs. At a rate of service jobs of 1 to 1 the overall impact on employment by the Park an additional 7,413 jobs have been driven through the development of the site[6].

Tech City – East London UK

The Tech City location is that it is based on the Shoreditch area of East End of London which originally grew up around supporting trade particularly commodities such as tea but as the rising cost of doing business in this location militated against this activity in the face of challenges from other cheaper and globally accessible locations the redundant Victorian and Edwardian warehouses gave way to either dereliction or small commercial activities. Rents in this area traditionally have been low for a city centre location, public transport is good, access to low cost rental commercial and residential property has been good.

For the first 17 formative years Tech City had no formal stakeholder engagement other than the discipline of supply and demand and its attraction as a "hip" place to locate a business. It

[6] Monck C. Aspire Report April 2013 – unpublished report about the performance of the Surrey Research Park using the UKSPA Aspire methodology for assessing performance.

developed with no specific purpose or strategy; it was not planned by any authority: in essence the private landlords, against a depressed market, took in artists as tenants and with the convergence of technology built on social media the area began to see a combination of technology and media companies.

With the emergence of the thriving digital technology economy a number of private landlords have recognised the opportunity of providing co-working spaces for sole traders and small businesses in the digital sector. These landlords have pioneered a space offering to these companies which through a membership fee allow access for daily use of the converted warehouses and putting in support facilities such a high speed broadband, networking notice boards, "Skype" studios, and meeting rooms. Typical examples of these projects include co-working spaces such as The Trampery, Central Working, TechHub and Hoxton Mix.

In November 2010 under the coalition government a strategy was put in place to capture the competitive advantage that the area offers to the businesses that have located there and build on this with policy support. Now rebranded and with UK government support much closer interest has developed in the site by the public sector.

The government Tech City strategy has three but distinct aims. The first, is to foster small and medium size businesses in the area; the second, to promote international investment into it; and third, to encourage its spread eastwards to the Olympic Park and surrounding areas, post-2012.

To support this process the government has put in place an agency to deliver these programmes which are London & Partners, Tech City Investment Organisation and the London Legacy Development Corporation.

Since the engagement of the UK Government in the area the number of digital and ICT companies has increased from around 200 to over 3,000 and by raising the profile of the companies in the area and promoting their high levels of innovation a number of other international companies such as Google, Vodafone and Telefonica as examples, have been attracted to the area as part of their open innovation strategies.

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In December 2012 the UK Prime Minister announced[7] plans to build a flagship £50 million technical and creative institute to foster the next generation of leading digital entrepreneurs. In a unique Government-funded project to be delivered in conjunction with the Greater London Authority, the centre will cement London's reputation as the first choice for the world's most creative innovators.

This new project is planned to

- Provide a business resource for 200 start-ups per year, and host a mentoring network for aspiring entrepreneurs.
- Host two major international conferences for global tech and creative industries each year.
- Help 1,000 young people each year find skilled employment, and support initiatives which make recruitment easier such as providing support around Visa applications for overseas workers.
- Engage up to 50,000 school children with enterprise programmes such as Coder Camp, TeenTech, and Computer Science for Fun.
- Support the growth of Digital Shoreditch Festival to an audience of 200,000.
- Lead 10 inward investment salons each year, and 10 overseas trade delegations with UKTI and the Mayor's promotional agency London & Partners.

[7] http://www.london.gov.uk/media/mayor-press-releases/2012/12/mayor-to-develop-high-tech-institute-to-drive-capital-s-21st

Links with universities and centres of technology

The presence of the Surrey Research Park on the University of Surrey Campus enabled Surrey Satellite Technology Limited (SSTL) which is the biggest spin out from any UK University to remain on campus in a commercial environment and retain links with the University that continues to act as SSTLs research lab.

The closest link for the companies on the Surrey Research Park is with the University of Surrey and these linkages are extensive ranging from informal arrangements that are technology network based such as sharing equipment through to formal operational links that use some of the UK Government's Technology Strategy Board's innovation programmes such as Collaborative R&D grants and Knowledge Transfer Partnerships, as well as formally contracted amounts of money to be spent in the University on specific areas of technology.

In addition many companies on the Park have links with other universities in the UK and centres of technology such as the government agency Qinetiq which is a British multinational defence technology company headquartered in Farnborough, Hampshire, which is 11 miles from the Park and is the world's 52nd-largest defence contractor measured by 2011 defence revenues, and the sixth-largest based in the UK.

The University of Surrey secured funding in 2002 from the UK Government to put to strengthen its support for incubation and business acceleration which it launched as SETsquared to provide technology and innovation businesses tailor-made business support.

This is supported by an Entrepreneur in Residence and access to a Mentor pool with a rich source of talent and enthusiastic support which provides advice, support and inspirational leadership to new up and coming entrepreneurs/ventures.

In 2011 the Surrey Space Incubator was launched with additional public money providing start-up and early stage businesses engaged in the Space Industry the same quality services as SETsquared.

In 2007 to support this the University also launched an Angel Club (Surrey 100) to connect start-up/early stage ventures and investors by facilitating access to funding and by building a world class support community. Its capability lays in cherry-picking a crop of businesses across all stages and from an extensive range of sectors and maximising their appeal to a broad community of investors. The Club showcases "investment-ready" ventures that are all part of the University of Surrey's Incubation Programme which is run across the campus and The Surrey Research Park. To date the Club has assisted ventures in raising over £17.5 million of early stage funding and despite the uncertain economic climate 75% of the companies selected to pitch at the Surrey 100 have secured funding.

Tech City also has strong working relationships with some of the world's leading academic institutions, including UCL and Imperial College and a new apprenticeships scheme with local Hackney College. In addition City University which has by chance its campus next to the area put in place a popup university[8] branded "Unrlyversity" which offers a range of free courses to the sector once a week. The content of these is focussed on relevant courses for the sector. This close common interest is an advantage as it enables the host university to specialise and build its own competence.

Employment and company data

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[8] : http://www.unrulymedia.com/city-unrulyversity

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A number of the companies that have remained on the Park have grown to be significant in their own right.

Companies on the Surrey Research Park and in Guildford that have grown on site include:

- Start-ups such as Lime Microsytems raised in excess of £20m, Modern Water raised in excess of £50m, Tisics raised £2m
- Growing companies TMO Renewables raised in excess of £40m, ReNeuron, SSTL
- Larger corporates such as BOC Linde Group, Syngenta, Hyder, IDBS, Microsoft, EA UK Ltd

Surrey key investments and acquisitions

- 1991 – Policymaster – acquired by Sirius Financial Systems - undisclosed sum
- 1994 Advanced Mechanics and Engineering acquired by Mott MacDonald – undisclosed sum
- 1996 – Bullfrog – acquired by Electronic Arts – estimated at £35m
- 1996 – Portable Addons – acquired SMC Direct – estimated sum £4m
- 1997 – Red Pepper Software – acquired by People Soft- undisclosed sum
- 1997 – Network Managers – acquired by Retix - undisclosed sum
- 1997 – TMO – estimated to have raised £40m VC
- 1998 – KS Bimedics – acquired undisclosed sum
- 2000 - Shogenie acquired by Kelkoo undisclosed sum
- 2000 – Monmouth Pharmaceutical – acquired by Shire Pharma - undisclosed sum
- 2001 Smith Associates sold through MBO for a figure estimated to be around £6m and renamed Detica in 2001. It was first listed on the London Stock Exchange in 2002 In 2003 the company acquired Rubus, an IT services business.[3] It went on to launch Streamshield, an internet security product, in 2004. In 2005 Detica acquired Extraprise UK, a systems integrator. In 2006 it went on to buy Evolution (a consultancy), Inforenz (a computer forensics business) and M.A. Partners (a consultancy serving the capital markets) and in 2007 it acquired DFI International (a consultancy serving the US national security sector. 2008, BAE Systems acquired Deitca – value believed to £568m. In 2011, BAE Systems acquired Norkom Technologies and merged it with Detica NetReveal and acquired ETI a cyber and intelligence company. Detica employs around 600 staff on the Park as well in a number of other sites in the UK.
- 2003 Merger of Vernalis Group with British Biotech in a deal valued at £90 million to create Vernalis plc.
- 2004 – Criterion Games – acquired y EA UK - £40m
- 2004 – Jamdat – acquired by EA UK - undisclosed sum
- 2005 Advanced Showers acquired £0.5m
- 2006 Akonix – acquired by Quest Software – undisclosed sum

[9] Monck C. Aspire Report April 2013 – unpublished report about the performance of the Surrey Research Park using the UKSPA Aspire methodology for assessing performance.

- 2006 SSTL – acquired by EADS Astrium – estimated £45m
- 2009 – Pertmaster – acquired by Oracle undisclosed sum
- 2012 – Acquired by TSG – estimated sum £50m
- 2002 to 2012 – SETSquared companies raised £106m equity

ID Business Solutions which was set up in 1989 and has since developed from a world leading niche IT consultancy that provides integrated software solutions for the pharmaceutical, cosmetics and business analysis sectors. It moved onto SRP in 2002 with 79 sq m and now occupies 1,105 sq m on the Park It also has an offices in London, Paris, India, Japan, China and four in the US. The company employs over 300 staff.

One of the factors noted by companies on the Surrey Research Park is that having access to space on a single site that is managed by one landlord is that this makes it simpler to accommodate the growth of companies in a single location by developing a close relationship between the company and the host/landlord. The benefit to the company of this arrangement is that they can retain continuity with customers and employees.

Current figures for the Park show that of the 119 companies on site with formal contract with the University for Office or laboratory space is that 63% have fewer than 10 employees. 25% employ between 11 and 50 staff, 8% between 51 and 250 staff and 5% over 250 staff. Of the latter group 2 have grown from the business incubator to their current size.

The Surrey Technology Centre is a fully managed incubator/innovation centre that also offers pre-incubation that has also put in place an Angel Investment Club which has raised in excess of £17m for the companies that have "pitched" through its activities.

The City and surrounding area has a population of 125,000 and has 55,000 jobs. The economic activity of companies based on an average turnover per employee of £150,000[10] with 3,200 employees on the site and 1,620 that have moved within the vicinity is in the order of £480m and £243m respectively.

On the basis that the site is 28.5 ha and only 82% developed this gives a figure of economic activity of £20m per hectare.

Tech City

A Centre of London report[11] noted that in 2012 around 3,200 technology firms have located in the area and together they employ around 48,500 digital economy jobs and that this level of employment is important to London's economy and this is enhanced by a multiplier effect.

Companies in Tech City include:

- Start-ups such as EDITD, Transferwise, Market Invoice, Farfetch, Lyst
- Growing companies such as Songkick, Mind Candy, Yammer, Huddle, Moo, Ideo, Berg, General Assembly, 7digital, Livestation, Airbnb, Twilio, Eventbrite and Mother
- Larger corporates such as Intel, Cisco, Amazon, Google, GREE
- Incubators such as Seedcamp and White Bear Yard
- Accelerators such as Techstars and The Bakery London (the world's first dedicated workspace and tech accelerator for the advertising, marketing and communications industry)
- Investors such as Accel, Passion Capital and Index Ventures
- Co-working spaces such as The Trampery, Central Working, TechHub and Hoxton Mix

[10]Based on survey work by the Surrey Research Park Office 2011.

[11] Nathan M., Vandore E., and Whitehead R. A tale of tech city Centre for London 2012. ISBN 978-1-909037-13-7. http://www.demos.co.uk/files/A_Tale_of_Tech_City_web.pdf

- Tech City also has strong working relationships with some of the world's leading academic institutions, including UCL and Imperial College and a new apprenticeships scheme with local Hackney College

Tech City companies: key investments and acquisitions

- April 2013 –Mendeley is acquired by Reed Elsevier for a reported £45m
- April 2013 – MMC Ventures and Mayor of London launch the $33m MMC London Fund to be invested in London Startups
- March 2013 – Summly acquired by Yahoo!
- September 2012 – iPlatform acquired by Betapond
- September 2012 – Mobcast co-founder Andy McNab, sells stake to Tesco
- September 2012 – Conversocial raises $1.25m from DFJ Esprit to fund expansion into US market
- July 2012 - $5m invested in Lyst by DFJ Esprit
- July 2012 - $2m invested in The Currency Cloud by Notion Capital
- July 2012 - £400,000 seed funding secured by MOVE Guides
- June 2012 – $1.4m seed funding secured by Makielab
- May 2012 - £2m invested in Cloud.IQ by Bridges Ventures
- May 2012 - $24m invested in Huddle by US investors
- March 2012 - $10m funding secured by Songkick from Sequoia Ventures; this was Sequoia's first UK investment
- March 2012 - $2.8m raised by Tribesports in Series A funding round
- May 2011 – May 2011 Twitter buys Tweetdeck for £25m

Founded in 2006, Unruly has 11 offices and employs over 125 people globally. In 2012, Unruly secured a $25 million Series A investment - the largest ever for a private company in the social video space. The company has won over 15 awards including "Best Content Distribution Service" at the Braves Awards; "Digital Innovator of the Year" at the Sunday Times Hiscox Tech Track 100 and #14 on the Deloitte Technology Fast 500 EMEA 2012[12].

Results of the review

1. The two projects that were reviewed could not have had more different origins or histories; however, both have evolved into successful projects that have had a significant impact on their localities.
2. The time scale for the early development of these two sites is comparable; however, with the higher density of companies and the significantly more narrow sectoral focus (digital media) of the companies in Tech City the growth in the number of these companies has accelerated more than the companies in Surrey which has a wider range of technologies being developed on site. The element of self-help that comes from the higher density of companies in a single discipline cluster is greater. This is an important lesson for city management and to politicians that are using S&TPs for economic development: these groups need to be patient while these projects mature.
3. In contrast to this benefit single technology clusters present landlords / hosts that have invested in new purpose buildings on a traditional science park, with much higher risks to rental streams than where the technology base is more diverse. With most city centre locations there is more than one landlord involved in these development so investors share the risk over a wider group. Edge of town science parks are therefore more likely to support a more diverse technology base than a city centre.

[12] http://www.unrulymedia.com/sites/default/files/Unruly%20Overview%202013.pdf

4. The provision of the infrastructure and premises in Tech City by the private sector and the strength of demand from a higher density of sole traders and technology entrepreneurs for space has enabled a number of landlords to experiments in terms of developing co-worker space which then are exposed to scrutiny by the market out of which the best model can be developed.
5. Both the projects reviewed have proved to be valuable in creating specialist collaborative networks that have been important in building technical and productive capacity in their respective area; however, the density of entrepreneurs and technologist in Tech City has made it possible to build these collaborations networks more quickly than in Surrey. Where Surrey has built networks they have a more of a generic interest in building technology businesses rather than building technology competences and capacity in the locality.
6. The presence of high density of skills in digital media, programming, content and access to finance with significant inward investment support from UKTI has enabled the Tech City to attract technology entrepreneurs from across Europe who are interested in starting businesses in the area. This is aided by the presence of a low cost rental housing sector which is less common in areas with lower housing density. This added component is a valuable element in building the company base Tech City.
7. The presence of the high density of innovative companies in the locality has been a factor in attracting larger corporations such as Google and Amazon to set up open innovation based business operations to drive their own innovation programmes. The presence of these companies has helped to raise the profile of the area and added to its image and reputation and that international interest has been leveraged because of the financial resource and policy discretion of government that stands behind the flag ship status of Tech City.
8. The high demand for bandwidth for a brief interval outstripped capacity but this was resolved by further private sector involvement. It is simpler for a single landowner and landlord to negotiate more bandwidth with a supplier when compared with dong this in a less planned environment.
9. The connections between universities and the technology companies in Tech City is more difficult to establish than in a university owned project such the Surrey Research Park. This more complex interface has driven the local universities in the City to adopt a number of outreach programmes to engage with the companies and this has been done by building partnerships with outward looking companies.
10. The range of modern purpose built facilities on the Surrey Research Park has proved to be attractive to a wider range of technology companies that have developed on the site. The constraints of re-using existing commercial buildings limits the possibility of innovative science based companies setting up in Tech City. It is suggested that the lack of diversity of companies will prevent strong cross sectorial linkages being developed which may limit innovative capacity and be self-limiting for the cluster.
11. The lack of public sector landlords that can use competitive rent offers to limit private sector rental growth may allow inflation in private sector rents to reduce demand from this highly mobile new generation of digital media entrepreneurs. This challenge may be compounded by the lack of governance of the cluster. The creation of a new £50m public sector led building may overcome this limitation.
12. Active management of a project in which a direct customer care programme is in place can help to identify limiting factors in a cluster sooner than otherwise might be the case. This active engagement may help with maintaining the vitality of a cluster for longer than when this kind of grouping is left unmanaged.
13. Because many of the companies in Tech City are small or even micro companies the area lacks depth in terms of numbers of staff that have experience of working and management large teams of engineers. This is a constraint to growth. In contrast the mix of management skills in a location such as the Surrey Research Park which has a wider range of companies is likely to be broader and can be helpful for those high growth companies that value that resource.
14. In Tech City despite the presence of self-help groups there is a lack of professional development support for managers in micro and SMEs in terms of mentoring services. The

unmanaged nature of the cluster of companies in Tech City militates against putting place some form of business management development.

15. Supporting an increase in the supply of qualified manpower should be put in place through altering visa restrictions and to try to encourage improvement skills of those already in the locality.
16. Many companies in the unmanaged Tech City environment would welcome the creation of an agency or advice programme for business that could help young businesses prepare the structure of their businesses for growth and take advantage of programmes through which to achieve this.
17. The development of the city based projects has been more rapid than the Surrey Research Park because the supply of accommodation is to an extent unlimited because Tech City has not boundaries other than those imposed by the cost of rent.
18. The diversity of technologies and the activities on the Surrey Research Park which include manufacturing is much wider than in Tech City. This is consistent with the strategy adopted for this Surrey Park which at one level was planned to diversify the local economy.
19. The master planning of the Surrey Research Park has enabled accommodation to be provided to house a satellite development and manufacturing plant that would not have been possible in the Tech City location.
20. The engagement of central government in the management of Tech City has allowed a close interest to be taken in the companies that they are working with directly and this is believed to be one of the reasons which the government has improved a number policies in relation to encouraging investment in R&D, innovation and related to exploiting patents.
21. One of the shortcomings of organic growth of a technology sector in a city zone is that means that the soft services that are traditionally a planned part of developing a science and technology park do not develop. A response in Tech City has been to implement an evening session once a week by the City University Business School to support the process: in effect was has become known in popular terms a "pop-up" business school that is offered at no cost to companies: this is well attended[13].
22. The growing concentration of ICT entrepreneurs and technologist in Tech City has attracted such companies as Google, WAYRA and Amazon to set up as research or open innovation related facilities through which to keep abreast of emerging ideas in the fast moving area of social media and other parts of the digital industries.
23. In contrast a number of Japanese companies such as Kobe Steel, Canon, Matsushita and Mitsubishi established traditional, albeit small R&D centres on the Surrey Research Park. The work in the Canon Centre led to a spin out computer games technology company Criterion Software that was eventually acquired by Electronic Arts that has developed in Guildford.
24. The letting policy adopted and the capacity to enable companies to grow on site was one of the factors that led to the formation of a significant games cluster in Guildford which continues to develop as new companies are being formed as new gaming platforms such as smart phones and games for these platforms are created.

Conclusions

The lessons that can be learnt from both of the areas reviewed are:

1. The science and technology park model is robust enough to be portable.
2. These projects benefit from on site management.
3. Self-help clusters have significant value and if possible city managers should engage with businesses in these area to see if their value can be leveraged.
4. The traditional science park model is more likely to produce advanced manufacturing companies than city centre clusters.

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