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## Evolving Business Models to Support the Growth of Technology-based Start-up Firms

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### Abstract

There is both a commercial and social imperative for innovation-led economic development. The data on inventions shows the importance of cities in the role of creating this important foundation to innovation. The importance of new venture firms in the innovation process of taking inventions to market is widely recognised, and with this recognition the science parks and science cities are working to understand and replicate the social, business and technology environments which are most fertile for these companies.

This paper reviews how those with an interest in this process have addressed this challenge with new business practices and planning activities. It draws particularly on the experiences of Tech City in London and the Surrey Research Park

### Keywords

Research parks, Urban innovation districts, Business incubation

## 1. INTRODUCTION

One of the messages of Adam Smith (1720-1790) referred to new layers of specialists who are men of speculation and who made important contributions to the production of economically useful knowledge. So the idea of entrepreneurs or knowledge playing an important role in the economy is not new.

Empirical research shows the continuing importance of entrepreneurs because start-ups both contribute more than existing firms to job creation (Acs and Armington, 2004) and new


business formation in innovative and knowledge-intensive industries and make an even greater contribution to economic growth (Fritsch and Mueller, 2008) than incumbent firms, even taking into account the negative effects of company failure and displacement of existing companies, because the overall the effect of competition and market selection brings significant competitive advantages and rising employment.

This has been reinforced by studies undertaken by Global Entrepreneurship Monitor (Reynolds et al., 2005; Romer, 1986) which have shown the importance of entrepreneurs as drivers of economic growth and of knowledge – a primary engine of economic development.

Empirical data from two studies on the Surrey Research Park re-emphasise the importance of these two aspects of economic development. This green field development which was opened in 1985 has supported the growth of over 500 companies. A study reported in October 2014 to the International Association of Science Parks Annual Conference (Parry, 2014)

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has shown that of the 488 companies that were part of the study 76% have been start-ups and all have been new technology based firms (NTBF). An analysis of the economic impact of these companies (BiGGAR Economics, 2013) reported that on an annual basis the current group of tenants in the park is contributing on the order of £500m to the regional economy.

This experience has also shown that these companies have been effective in driving innovation in all its dimensions, from incremental innovation to breakthrough technologies, in supporting open innovation relationships, and in some instances laying the foundation to building large companies.

This wide range of important roles for NTBFs has stimulated a number of initiatives to accelerate the formation and growth of this important group of companies. These initiatives have not only been developed on place-based locations such as business incubators on science parks and cities but also included new business modelling strategies, support programmes and funding regimes.

The more widespread use of business incubation has been in part a result of the science parks movement which has adopted and refined this activity. This wider use of the process and interest in its impact has raised a number of questions which include: what is the optimal set of social, technology and business conditions to encourage the formation and growth of these new companies; how can the process can be supported; and what lessons can be learned from these companies about venture business development from the experience of those involved in business incubation?

## 2. SCIENCE AND TECHNOLOGY PARKS

The science and technology park movement, active for over 60 years, has been adapted to work with a range of host organisations and has pioneered, shaped and popularised a number of business development initiatives.

Reviewing the membership of Science and Technology Park Associations around the world reveals these centres are now not only associated with universities (Cambridge, Warwick The Surrey Research Park in the UK), but also hosted by functioning corporate or public research laboratories (Philips Research campus Eindhoven and the Unilever's Colworth Park UK), by research institutes (Norwich Science Park which is collocated with The John Innes Research Centre and associated Sainsbury Centre, the Institute for Food Research, The

Genome Analysis Centre, the University of East Anglia and the Norfolk and Norwich University Hospital) as well as in city centre universities (TUS Park Beijing).

A long term view of the science and technology park movement shows these centres have emerged as a distinct kind of highly serviced property developments that are now 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.

The range of objectives for the variety of stakeholders include commercialising technology, creating an independent income for a host, creating high value employment, supporting skills retention in a region that is prone to loss of talent from outward migration, attracting foreign direct investment to a location, raising the profile of a location or region, establish a focal point and leadership role in supporting 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.

Despite this diversity of locations, hosts, funding and objectives for science and technology parks it is possible to see the underlying strategic aim all of these projects is the development of a modern knowledge led 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.

## 3. SCIENCE CITIES – WHY THEY ARE IMPORTANT

In 2011, 52% of the world's population was already living in urban areas and the trend is growing with 180,000 more people moving into them every day (United Nations, Department of Economic and Social Affairs, Population Division, 2012).

In the context of science cities this process of urbanisation has a number of dimensions. The first is how can science and technology help to meet the significant challenges to city authorities and citizens of housing, transport, creating high value employment to support their growth?

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, and linking entrepreneurs and financiers (Duranton, 2008).

Common attributes of cities are that their populations tend to have high levels of education and associated pools of high skilled labour, they often host large research universities, they have large markets for goods and the entrepreneurial pool with access to investment capital to address these markets, they offer good transport infrastructure (air, road and rail) and telecoms connectivity, they have access to culture and in some instances natural amenities, and are highly networked.

It has been known for a long time that cities are at the forefront of the development of science and technology with most research activities concentrated around major metropolitan areas and that the top 75 science-producing clusters in the world from 2006 to 2008 generated some 57% of the research and publishing 3.9 million papers (Matthiessen et al., 2010). Work based on data on patents (Youn et al., 2014) noted that with 97% of inventions between 2000 and 2010 having been made in urban areas.

What is of interest is how to identify the factors that drive successful research clusters which can then help city planners and policy-makers decide on what kind of investment is needed to make cities work in this way and more importantly what measures are valid in trying to analyse these factors (Matthiessen et al., 2010; Van Noorden, 2010) to try inform those building profitable centres to drive employment creation. An analysis by Strumsky (2014) has shown that size of the city has a very strong influence on productivity in terms of invention and innovation. Her work has indicated that as cities scale the inputs to the city produce superlinear outputs in terms of inventions and as a result, innovation. Based on this analysis there is a strong argument that that to maximise the return on investment the precursors of invention (Figure 1) should be concentrated in cities or in other highly networked regions.

It is clear that building on origination is a critical part of economic development and the process requires the intervention of entrepreneurs/ intrapreneurs to drive the process, the development of new business methods to support their activities and the need for wider connections through networks that help create the interfaces between government policy, knowledge creation, financial markets and business.

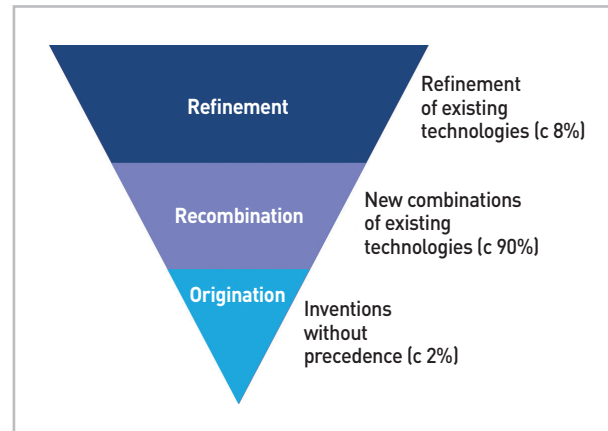


Fig. 1. The levels of innovation which represent the deployment of technology in the commercial domain

Source: Strumsky (2014)

Research (Strumsky, 2014) on these networks has helped to reveal those of their characteristics that are most productive, these include:

- Large loosely coupled networks of people and technologies.
- Specialisation that can support “origination” can bring a competitive advantage in related technologies.
- Networks that operate in isolation may fail to appreciate novelty and value as they keep pursuing ideas that are not productive which in effect redundant information keeps being recycled.
- There needs to be the capacity, which in city planning terms means space, to introduce new people, new information and new technologies into the urban system.
- Part of the cross fertilisation of ideas means that there needs to be external connections to other cities.

Despite these advantages the increasing levels of competition for markets means there remains a significant challenge for city authorities in creating the right environment in which to create high value jobs that can drive a city’s economy and sustain this over the next 50 years and in some cases such as Detroit in the USA resolve huge economic issues that overlay these old cities that have lost huge levels of corporate based employment.

In addition there are also new initiatives being proposed to meet the real challenges that countries like India face as it plans the 100 smart cities that have been promoted by the new prime minister of India Narendra Modi (India Today, 2014).

The challenges of these locations include:

- In terms of infrastructure, 24x7 availability of high quality utility services.
- A robust transport system that emphasises on public transport.
- The social infrastructure, to provide opportunities for jobs and livelihoods for its inhabitants.
- Proper facilities for entertainment and the safety and security of the people including state-of-the-art health and education infrastructure.
- Minimising waste by increasing energy efficiency and reducing water conservation. Proper recycling of waste materials must be done in such cities (India Today, 2014).

To achieve these ambitions and to deliver sustained and sustainable economic development driven by the private sector needs substantial investment in supporting the development of opportunity driven entrepreneurs in order to capture individual talent and commercial acumen and deliver innovation.

There are already a number of cities or zones of cities that have termed themselves as science or tech city locations. These include Tech City in East London UK which has emerged as cluster of media and digital economy cluster that was entirely generated by private investment, 22@ Barcelona which has been planned and developed by a city authority, and some which are ostensibly new development such as Cyberjaya and DMC respectively in Malaysia and South Korea that have been planned and developed by their national governments.

#### 4. GROWING VENTURE FIRMS

Early adopters of science parks were among the first organisations to systematically develop business incubators. Over the last 30 years these centres have evolved into more sophisticated initiatives that have added substantial levels of business support service to their offering which complement the changes in technology that have opened up new markets and built new routes to markets for start-up and venture businesses.

Common programmes today include:

- Pre-incubation and co-worker programmes that have widened the programmes on offer from simply supporting technology development to now include supporting company and market development.

- Business accelerator programmes.
- Access to equity finance schemes at a range of levels from business angel finance to venture capital.
- Access to business skills such as those offered by entrepreneurs in residence.
- Mentor programmes for companies that have evolved out a more effective professional business mentor training programmes.
- Business coaching for that has become more professional and more accessible.
- Improving and more widespread use of business modelling techniques.
- Wider range of degree programmes in universities that are producing better qualified and a more versatile talent pool from which to recruit business personnel.
- Novel programmes supported by universities to help new venture firms gain access to and develop the necessary technology and skills to create sustainable development.
- Links into open innovation mechanisms and programmes that have been developed and deployed across regions.
- Development of co-creation programmes that support customer – supplier relationships.
- Government grants and funding programmes for start-up and venture businesses that include grants for R&D, improved fiscal policies that give tax relief on R&D which are also allied to more flexible definitions of R&D to encourage investment in this activity and supra-national programmes such as the EU programmes as Horizon 2020. The UK has an Innovation Agency that has a number of funding schemes in place to support micro companies and SMEs.
- Increased national spending on R&D that is more targeted to make an “impact” on which to base innovation.
- Government policies on supporting innovation which have been established through the creation, in the UK, of a national innovation agency.
- Nationally funded programmes to increase the level of design activities for driving design into product development.

These are extensive and important improvements to the programmes that underpin the development and support of venture firms.

The experience of developing the Surrey Research Park over 30 years is that companies develop through a number of phases. These were reported in a paper to the IASP conference in 2011 (Parry, 2011) and the details are characterised in

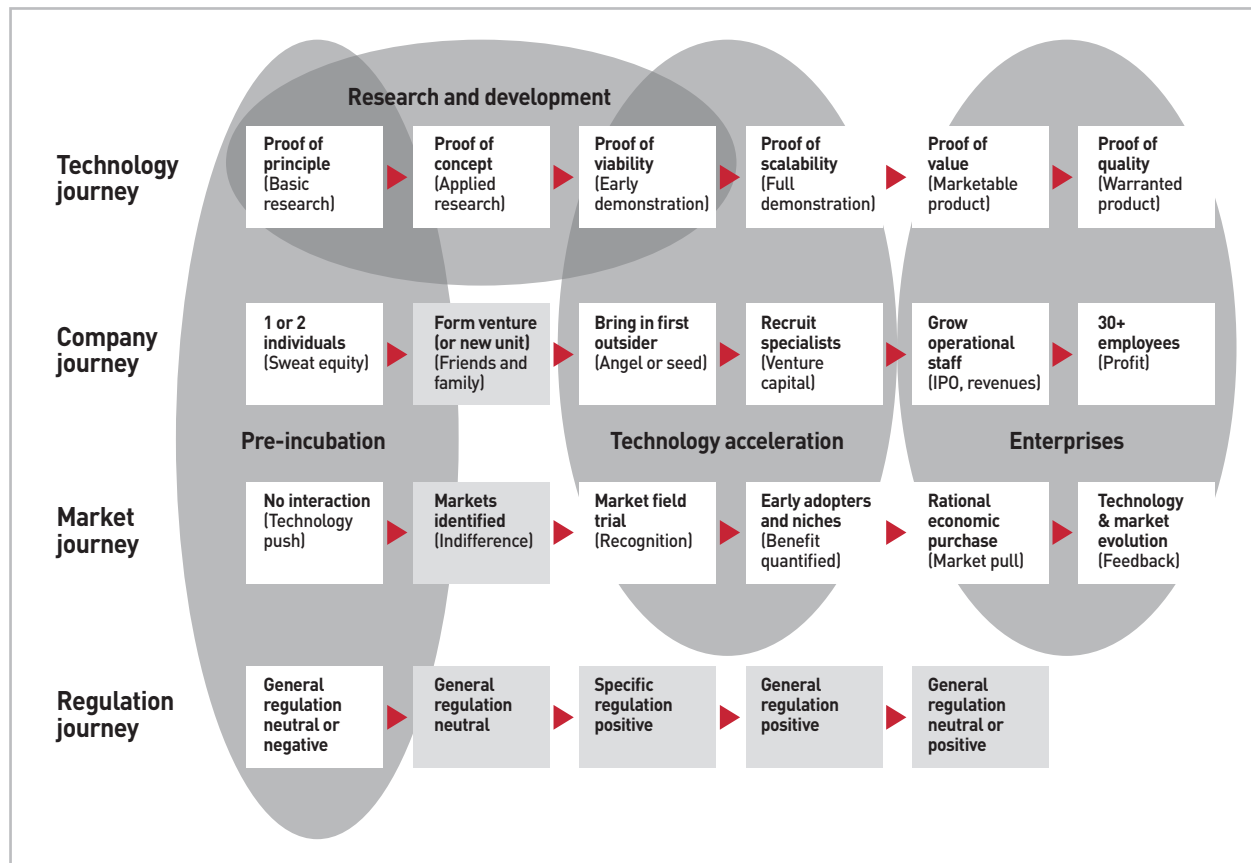


Fig. 2. The stages of development of companies on the Surrey Research Park developed from observations on a significant sample of businesses which have located on the site over the last 25 years

Figure 2.

These journeys, which operate under the control of a regulatory framework, (World Bank Group, 2014) are influenced by entrepreneurial, technical and business skills.

The level of intervention offered by these programmes can influence the various stages of what has been characterised as technology, company, market and regulation journeys (Parry, 2011).

The experience of running the Surrey Research Park, the Surrey Technology Centre, its pre-incubator and its Business Angel Club has revealed that the majority of entrepreneurs have developed their ideas for a new business while working for another micro or SME, a major corporate, a public sector organisation or with the university sector.

The motives for making a decision can vary from individual to individual but it is usually driven by opportunity rather than necessity and when the decision is made many of those mov-

ing into this new sector do so with some loyal customers from their existing networks. In all instances the view of the entrepreneurs is always that they have an understanding of a problem that their idea as a solution and commonly they think they have the potential to resolve this by using their skills, knowledge and idea. Once this idea has been thought through this is followed by setting up a business.

### *Pre-incubation and co-worker programmes*

Many business incubators have extended the service they offer to provide accommodation for pre-revenue companies that are at an early stage of developing their ideas. Commonly the physical facility for these centres is based on a shared co-worker space. The level of sophistication of these areas has been raised by a number of commercial enterprises entering the market in locations such as Tech City London and Silicon Alley.

In Tech City the emergence of the thriving digital technology economy has encouraged investment by a number of private landlords that 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 the US the Grind projects offer a similar programme and some large companies such as Google have created similar spaces to try to create open innovation programmes through membership in order to keep in touch with grass-roots digital based innovations.

On the Surrey Research Park, we have allocated 240 m<sup>2</sup> of 7,500 m<sup>2</sup> of the Surrey Technology Centre to provide for this early stage activity known as Surrey Incubation. The support offered by this programme includes: involves recruitment which includes selection, business development, mentor allocation, access to entrepreneurs in residence for business development, monthly or bi monthly progress meeting, pitch training and fund raising.

- Regular business support/advice meetings with the Entrepreneurs in Residence.
- Quarterly and an annual business review with a panel comprising of external experts.
- Sales Training and pitch training.
- Investment Readiness Programme.
- Access to Surrey University’s Angel investment club – Surrey 100 Club.
- Access to Knowledge Transfer Partnerships.
- Promotion of the company through the Park’s website.
- Access to an Annual Investor Event in London each October.
- Allocation of a business mentor/s.
- Access to Research Park affiliates who provide pro-bono, discounted and fixed fee work.
- Access to seminar, workshops and networking activities

### ***Business modelling***

The system for supporting business development at Surrey is to use a bespoke system for company development; however, over the last 7 years there have been a number of pro-

grammes that have been developed to support the business modelling process which are also supported by the Centre.

Examples that are current used by agencies in the various venture business development programme include Lean Start-ups (Ries, 2011) which has a strong focus on the software sector and adopted by many, as well as the Business Canvas Model that has been developed by Strategyzer.com.

Both of these programmes are prescriptive in that they follow a mnemonic pattern of activity that helps to pull entrepreneurs out of the detail of their plans to refine the basic hypothesis of their business model.

In this business canvas model the principles it adopts is to take a business hypothesis and test this through a structured process to develop an understanding of the elements that need to be developed to build the supply chain, the offer to customers and the revenue stream.

The principles of this programme are concerned with understanding the following groups and the relationships between these that need to be developed to test a business idea. These include:

- The customer: which customers and users are being served and how will your solution benefit their interests? What is their problem that you are solving?
- The value proposition: what are you offering them and what does your solution going to do for them and do they care about what is being offered? What is your solution?
- Channels to market: how do you reach each customer or the customer segment and what are the connection or interaction points with them?
- Customer relationships: what relationships will you need to create or are already in place to engage the customer? These include personal connections, one that are based on automation, and finding new customers and keeping these – often described as acquisition/recruitment and retention?
- Revenue streams (monetising): this raises questions about what are customers willing to pay for, how will they pay and are the payments based on individual transactions or providing recurring revenue?
- Key resources: this raises questions about the key resources that are required to create the foundation for the business model and what assets are essential in creating the business. These include for example personnel, finance, and accommodation but this covers wider issues too.
- Key activities: all businesses have a core of activities that are essential and critical for the success of the business.

- Key partners: examples of the organisations and suppliers to the business include those that may be necessary for licencing a business or product, supplying services to make the model work, and delivery. In essence who and what does the business rely on to deliver the value proposition to customers in order to secure the revenue they generate for the business?
- Cost structure: to ensure income exceeds costs in any business it is critical to understand both the cost structure and the elements that drive the cost.

This programme, which is proprietary to Strategyzer.com, is now being extended with a Value Proposition Canvas that helps improve the granularity of the value proposition and its fit to the customers' requirements and the value map of a product.

### *Innovation and growth hubs*

The theoretical work on the productivity of cities (Strumsky, 2014) has identified the importance of networks in helping to generate the productivity of cities. The Surrey Research pioneered the concept of an innovation network over the period of 2007 to 2012. This network was established in order to create and manage linkages between a portfolio of companies which ranged in size from those with a turnover of less than £1m to multinationals with a turnover in excess of £500m.

The programme proved to be very successful in forming active networks between micro, SMEs and big businesses, linking investors with companies seeking funds and partners in the knowledge base. The advantage of this programme is that it did not focus on just a single sector or on companies within a single defined size of turnover. The value came from the ability to help cross fertilise ideas and the work it did in terms of building networks.

### *GrowthAccelerator*

In 2012 the UK government implemented a new programme known as GrowthAccelerator and the contract to deliver this was won by Oxford Innovation. This programme is a premium service which has helped 26,000 of England's brightest growing SME businesses to achieve their ambitions for rapid, sustainable growth.

The programme provides world-class growth experts to work with the leaders of small and medium sized businesses with high-growth potential to focus on addressing the real challenges facing the business and assist them in defining and

implementing a unique growth plan for each business.

Aspects of these programmes include with bespoke help to:

- build a successful growth strategy;
- discover new routes to funding and investment;
- unlock their capacity for innovation;
- harness the power of their people; and
- unite and excite their leadership team.

The key elements of the service that are tailored to addressing each business's needs are:

- an expert coach to work 1-1 with the senior management team of the business
- up to £2,000 match funding for senior managers to hone their leadership and management skills
- membership of GrowthAccelerator alumni community

The GrowthAccelerator service is very practical and is results driven and each business develops a brief for its coaching support that identifies its key barriers and 2-4 specific deliverables that the coaching intervention will deliver.

There are well established market failures that affect the use of external business support and these primarily stem from incomplete and asymmetric information. Evidence suggests that many businesses are unable to assess their support needs, the potential benefits of support for their business and the quality or impartiality of support providers. Financial constraints can mean that even those willing to meet the market cost of support may not be able to do so. The existence of market failures determines that without government intervention, use of business support will be less than optimal (Department for Business Innovation & Skills, March 2014).

The programme has been highly successful. Between 2012 and 2014 the businesses it has worked with have delivered £1.5bn worth of growth and created 36,572 jobs. Over the past financial year, the SMEs in the programme have produced a 7 per cent increase in growth and a 5 per cent increase in jobs, whilst GrowthAccelerator backed businesses generated a 32 per cent increase in growth and a 36 per cent increase in jobs.

### *Funding regimes*

Critical to success of any company is access to funding. Over the last 10 years the industry associated with funding has grown very substantially, albeit with a hiatus in this during the period from 2007 to 2010. The increasing complexity of creating self-sustaining businesses has seen a parallel increase in funding programmes.

Table 1. Satisfaction of activities and area of GrowthAccelerator service

Activity supported and areas where improvements were made for companies	Yes, to a large extent	Yes, to some extent	Total
More likely to grow	61%	35%	97%
Planning	54%	36%	90%
Marketing	35%	41%	77%
Coping with economic downturn	28%	47%	75%
Spotting opportunities	27%	46%	73%
Developing new products	26%	44%	70%
Understanding risk	21%	42%	62%
Financial management skills	26%	35%	60%
Managing costs	20%	40%	59%
Investment readiness	19%	40%	59%
Seeking external finance	22%	32%	54%
Started to export	2%	10%	13%
Exporting	3%	9%	13%

These include public sector grants and contracts to support innovation, an increase in loan and equity funding programmes of which some loan schemes are backed by government, and public participation by crowd funding.

In addition, significant improvements have taken place in training and mentoring for businesses in relation to building finance ready companies.

#### ***Business – government axis***

The business community in the UK has always had a strong voice through such organisations as the CBI<sup>1</sup>, Chambers of Commerce, AIRTO (Association for Innovation, Research and Technology Organisations) and TechUK among others.

In 2003 the merger of the Federation of the Electronics Industry and the Computer Services and Software Association created TechUK which has over 850 members and that represent five hundred thousand employees.

TechUK has published a manifesto<sup>2</sup> for the period 2015 to

2020 that sets out 24 recommendations for the UK political parties. These are powerful messages from industry to government to strengthen its leadership, help secure the UK leadership in the use of tech by increasing and ring-fence funding for innovation, delivering the skills needed for business supporting tech cluster formation, and deploying technology to deliver the internet of things and other business opportunities. It also is suggesting the importance of harnessing the transformational power of tech across the public sector while also ensuring the digital world is a safe and inclusive place.

#### ***Science and technology parks and science cities – place based investments***

##### **Surrey Research Park – Guildford UK**

The Surrey Research Park is a development that has been undertaken by the University of Surrey over the last 25 years on 28.5ha of its own land holdings that lie on the outskirts of a market town close to London and which has been master

<sup>1</sup> Confederation of British Industry (CBI). <http://www.cbi.org.uk/>

<sup>2</sup> TechUK. <http://www.techuk.org/>



planned to provide pre and full incubation, accelerator units and space for larger companies to locate in around 60,000 m<sup>2</sup> of space.

The facilities that have been built are also supported with a range of business development services that are funded by limited government grants, and it operates an associated business Angel Club.

Data recorded from the site shows it has:

- Helped to create an internationally recognised computer games cluster in Guildford.
- Seen substantial spin-out and spin-off activity from the University of Surrey.
- Supported companies that have raised more than £750m of equity.
- Has around 144 companies in space on the site and an additional 65 companies registered in the pre-incubation programme.
- Attracted companies that employ some 3,200 staff and over the years the companies that have located on the site have created also further 4,000 jobs in the region as they have graduated from the site.
- The companies on the site contribute in the region of £400 to £450m a year to the regional economy (Monck, 2013).

This site has been very successful in providing pre and full incubation, accelerator space and larger building for specialist companies. It is clear that this project has met its objectives of supporting the development of high value companies that are active in export.

## **Tech City – East London UK**

The Tech City is based on the Shoreditch area of East End of London which originally grew up around supporting trade, particularly commodities such as tea. 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, and access to low cost rental commercial and residential property has been good.

For the first 17 formative years Tech City had no formal stake-

holder engagement other than the discipline of supply and demand and its attraction as a “hip” place to locate a business. It 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, the UK government has begun to add its support to the area to encourage the development of this cluster.

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 pop up university<sup>3</sup> branded “Unrulyversity” 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.

In addition, the site has attracted foreign direct investment with the presence of a Google Campus that offers a range of supportive courses and opportunities to entrepreneurs wishing to start a business.

### ***Results of the review in terms of supporting technology businesses***

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.

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 me-

<sup>3</sup> <http://www.unrulymedia.com/city-unrulyversity>

dia) 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.

In contrast to this benefit single technology clusters present landlords / hosts, which 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 developments 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.

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 experiment in developing co-working space which then are exposed to scrutiny by the market, with the result that the best model can be developed.

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. The Surrey-built networks have a more generic interest in building technology businesses rather than building technology competences and capacity in the locality.

The 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.

The presence of the high density of innovative companies in the locality of Tech City 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 which has been leveraged because of the financial resource and policy discretion of government that stands behind the flag ship status of Tech City.

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 doing this in a less planned environment.

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.

The range of modern purpose-built facilities on the Surrey Research Park has proved to be attractive to a wider range of technology companies. 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.

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 and in the end may cause its demise because the lack of governance means it will be hard to control rents.

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.

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.

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.

Supporting an increase in the supply of qualified manpower should be put in place through altering visa restrictions and to encouraging the improvement in skills of those already in the locality.

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.

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: Tech City has no boundaries other than those imposed by the cost of rent.

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 the Surrey Park, which at one level was planned to diversify the local economy.

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.

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. This is believed to be one of the reasons why the government has improved a number of policies in relation to encouraging investment in R&D, innovation and related to exploiting patents.

One of the shortcomings of organic growth of a technology sector in a city zone is 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 has become known in popular terms a “pop-up” business school that is offered at no cost to companies: this is well attended<sup>4</sup>.

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.

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.

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 and new gaming platforms such as smart phones and games for these platforms are created.

## 5. CONCLUSION

Venture start-up companies play an important role in job creation and innovation in all its guises. Critical to the development of these companies is the role played by opportunity-led entrepreneurs. The infrastructure to support these entrepreneurs has been developing over a number of years with the formation and evolution of science and technology parks and now with the development of science cities.

The drive to build smart cities is also accelerating with the level of urbanisation now being experienced worldwide. To help to ensure that these cities create high level employment needs careful planning and implementations and it is suggested to learn from the experience of science and technology parks in their traditional role of business incubation.

This experience includes helping companies to form, find funding and grow within a business, social and technology environment that helps to find effective business models that increase the chances of success.

Two examples of these kinds of sites, the Surrey Research Park, Guildford UK and Tech City, City of London UK reveal that they differ as sites that support these companies but they share a common purpose and have a number of useful ideas that can help to support new Venture Firms.

<sup>4</sup> Pers Comm Fothergill, J. Pro Vice Chancellor – Research and Enterprise, City of London University.

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