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The North East Technology Park: A Case Study for Embracing Innovation to Enable Technologies, Industries, Communities

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Executive Summary

‘If technologies are points and industries are lines, then communities are planes, and even multi-dimensional structures’.

This quote, from Xiadong Zeng, sums up the function of the North East Technology Park (NETPark), which has embraced innovation to become the nexus of interconnected economic development strategies for technologies, industries and communities.

The objectives of NETPark have not changed, but its technology focus and its role have recently evolved substantially, because of two reasons. Firstly a decision, strongly influenced by the activities of companies on site, to focus on a technological core competence rather than one based on a technology sector or market application, and secondly, a conscious effort to broaden NETPark’s role to join up a range of economic strategies currently being developed. This paper aims to illustrate the journey from NETPark’s early days as ‘buildings in a field’ to its current role as node and flagship for a much broader interpretation of innovation.

Context

NETPark is in County Durham, United Kingdom (UK). The County is home to about 500,000 people and is primarily rural with a dispersed settlement pattern, reflecting the communities that grew up around the coalfields which provided the primary source of employment for many years. There are areas of industrial activity (primarily around the main road routes north-south the A1 and A19), which are mainly manufacturing and engineering, accounting for 20% of the County's economy. Durham City itself is a key economic driver, home to important service and public sector organisations such as the University, the Police and the County Council, along with strengths in tourism, retail, leisure, digital, and creative industries. Figure 1 illustrates the location of County Durham within the UK.

Figure 1: County Durham

Despite the fact that certain sectors are thriving, County Durham still lags behind on some significant economic indicators:

- The Gross Value Added is 59% of the UK average.
- The employment rate is currently 68.7% of the working age population.
- Household disposable income is below the rest of the North East.
- 168 areas in County Durham are in the top 20% of most deprived areas in Europe.
- Durham Tees Valley is the third poorest area in Northern Europe.

This has resulted in social issues such as lack of aspiration, 'third generation unemployed' and a large number of young people not in work, education or training.

However, County Durham has some significant assets: there is an industrial heritage to be proud of and substantial existing capability in manufacturing, along with significant research strengths, a spirit of inventiveness, and a strong and resilient community spirit.

North East Technology Park

NETPark is a highly targeted policy response to this pressing economic context: to tap into the wider capabilities of its economy, designed to create new, high value, highly paid jobs which are close to home for local communities but which also attract and retain talent. Formerly, communities developed around agriculture and mining. NETPark's aim is create communities around the new economy of innovation and knowledge and hence act as a catalyst for sustainable economic development.

Opened in 2004, and managed by Business Durham, the economic development company for County Durham on behalf of Durham County Council, NETPark provides the innovation and commercialisation support infrastructure that was missing in an area where there is already great invention capabilities and a strong manufacturing base. It has already accumulated some significant assets on site.

NETPark has two 'Catapult' centres, a network of world-leading centres sponsored by Innovate UK, the UK's innovation agency, designed to transform the UK's capability for innovation in seven specific areas and help drive future economic growth. The Catapult network is a series of centres where the very best of the UK's businesses, scientists and engineers work side by side on late-stage research and development, transforming

high potential ideas into new products and services to generate economic growth. NETPark has centres for the High Value Manufacturing Catapult and the Satellite Applications Catapult.

It is also home to the UK's National Printable Electronics Centre, and has been announced as the location of the UK's National Formulation Centre and the UK's National Healthcare Photonics Centre. All three Centres are managed by the Centre for Process Innovation (CPI), a technology innovation centre using applied knowledge in science and engineering combined with state of the art facilities to enable companies to develop, prove, prototype and scale up the next generation of products and processes.

Durham University, a world top 100 university[1]Ranked 83rd in the THE world rankings (2014) and 92nd in the QS World University Ranking (2014)] and top five in the UK[2], Fifth in The Complete University Guide 2015, and sixth in The Times and The Sunday Times Good University Guide 2015] has two research groups on site at NETPark. The Centre for Advanced Instrumentation makes instruments for ground-based telescopes such as the South African Large Telescope and the European Extremely Large Telescope, as well as space-based telescopes, such as the James Webb Space Telescope which NASA is due to launch in 2018. The Advanced Inorganic Materials Group is also on site and spun out one of NETPark's most successful companies, Kromek, which is part of the cluster of companies in microelectronics, photonics and nanotechnology, and their application in the fields of energy, defence, and healthcare.

There are currently 25 organisations on site at NETPark, employing approximately 400 people in high value-adding roles (98% occupancy of built space).This represents about 5% of its total capacity of approximately 9,000 – 10,000 jobs on site. Figure 2 illustrates the existing development and the next 10 years – there is additional land at the top of the image which is allocated to NETPark for development (about 90 ha in total).

Figure 2: NETPark now and NETPark 2025

It has always been clear that NETPark is a longterm economic development intervention, needing at least 20 years to fulfil this potential. Because of the longterm nature of this particular economic development intervention, the view was taken very early on for NETPark to be as outward facing as possible. It was only 'buildings in a field' for a very short time.

In 2007, three years after opening NETPark, we launched the NETPark Net innovation community to provide virtual office, events, innovation support and market access services to companies which are not resident on the park. This increases NETPark's critical mass, widens the pool of potential partners, embeds NETPark as the flagship of innovation for the County, and acts as a pipeline for potential tenants for NETPark. This is now

1.Ranked 83rd in the THE world rankings (2014) and 92nd in the QS World University Ranking (2014)
2.Fifth in The Complete University Guide 2015, and sixth in The Times and The Sunday Times Good University Guide 2015

used by nearly 350 companies, in sectors ranging from aerospace to construction, finance and defence. We are active in encouraging companies to seek partners from all over the UK: currently, the 25 organisations on site at NETPark have nearly 160 live university collaborations between them.

In addition, recognising that people who will work at NETPark in the future are, in the main, still at school, NETPark has been very active in the wider community since 2008 through initiatives such as family science festivals, continuing professional development for local teachers, science animators in schools, workshops on site, and a programme of inspiring speakers. This programme has interacted with approximately 45,000 people.

Since 2010, we have actively participated in industry associations such as the United Kingdom Science Park Association and the International Association of Science Parks and Areas of Innovation, benefiting from the sharing of best practice, a wide pool of potential partners and an increased profile. More recently, NETPark has been active in local and national government circles, leading on the development of the 2014-2020 European Structural and Investment Fund Strategy Priority One (Promoting Research and Innovation) for County Durham, and helping to develop North East England's Local Enterprise Partnership's Innovation Strategy and the Smart Specialisation Strategy.

Using specialisation to stimulate innovation in a shifting world

The NETPark cluster reaches far beyond its physical boundaries in embracing a broad view of innovation and its ability to deliver transformative economic development goals but, perhaps counterintuitively, it has been able to do this because of a clear focus on site on the potential of science-based companies for growth, acting almost as an arrowhead for encouraging innovation and raising aspirations. That specialisation has recently undergone a strategic review.

NETPark has always specialised in physics-based science commercialisation, primarily because of the alignment with the strengths of Durham University and with local manufacturing activities. NETPark's technology focus did not change significantly in its first 10 years: this specialisation has allowed NETPark to achieve several things. In the local (and even the national) market, there are other innovation activities and there are also other business and industrial estates. NETPark's focus on the physics-based sciences and on creating a like-minded community of technology companies has allowed it to be clearly differentiated from these other offers. We very rarely get unsuitable enquiries and we have a very high conversion rate of companies that visit NETPark as part of the decision to locate to those companies moving in: this allows us to be very lean in our marketing efforts. We have also been able to select partners with similar objectives, which has resulted in NETPark's development being guided by a strongly linked central group of Business Durham, CPI and Durham University, building a knowledgeable team to accelerate the growth of the companies at NETPark into global markets.

However, in 2014, NETPark underwent a strategic review which resulted in a fundamental shift in specialisation. This shift came about from an analysis of what companies at NETPark actually do: they take a core material and integrate that into a high value product. For example, Kromek plc started as a two employee spin out from Durham University, which could make Cadmium Zinc Telluride (CdZTe), a semiconductor material, extremely well, selling it to other companies which then developed products with CdZTe at their heart. However, the company soon realised that all the value was in the products in which CdZTe was used and this realisation led to Kromek transforming itself from a materials company into a product company. This is a significant shift in business model and has been very effective, turning the

company from a small university spin out into a plc. Kromek has expanded from two employees to 60 on site at NETPark and has acquired two subsidiaries in the United States, one of which created a radiation detector chip for NASA's Mars Curiosity Rover. The company has created an array of products in health, security and nuclear detection, using CdZTe to, for example, detect liquid explosives and radiation in food and to measure bone density. Recognising what its core competence actually was led to a fundamental change in business strategy, and parlaying that competence into providing solutions the market wanted led to rapid growth.

PolyPhotonix, another company at NETPark, has a core competence in developing Organic Light Emitting Diodes (OLEDs) and has been at NETPark since 2008. In the last few years, the opportunity of integrating OLED technology into health devices has been the catalyst for the company's rapid expansion and the launch of the first product: the Noctura400, a Sleep Mask for the treatment of Diabetic Retinopathy which can halt the blindness associated with diabetes. The UK's National Health Service predicts that just this one product will save it £1BN per year. This is the first of many products in the healthcare photonics market, catalysed by the original idea of integration of the core material into a product.

The realisation that the materials integration is the process which creates the companies and jobs, not the creation and commercialisation of the core material, has enabled NETPark to create a different focus. It is a 90 degree shift in outlook which is less about traditional technology disciplines and vertical market sectors, and more about a core technological competence. That competence is materials integration.

This analysis of company activity at NETPark has led, not to a change in objectives, but to a way to scale up and accelerate NETPark's growth to achieve those objectives. This focus on scale up and acceleration acts as an umbrella for all activity on site, allowing us to accommodate new activities while being specialised enough to remain differentiated in the market. A competitive landscape analysis indicated that, while many universities, science parks and areas of innovation indicated a focus on materials, until now, none has so far labelled themselves as a place of materials integration, a place where companies can integrate innovative materials into high value products that catalyse and accelerate growth.

This message was launched in late 2014 and has been warmly welcomed by stakeholders. Now we have the much harder task of actually delivering it and we have agreed with Durham University and CPI to deliver activities under five workstreams: Research Excellence, Innovation Infrastructure, Property, Skills, and Communications. Finance and funding underpins all of these workstreams.

Picking this unique theme has enabled us and the University to assess how its research activity fits into NETPark's mission and perhaps where there are opportunities to attract more, and from other universities.

Innovation services have been mapped to the materials integration process and are being reorganised and enhanced: for example, the integration process demands design and software expertise (as well as materials expertise) yet NETPark has no structured offer in this area, so this is being put in place. While we offer good market understanding and access to finance services, companies have told us that we have a gap in providing a supportive recruitment service and also a specialist export service. Our support programme for companies is becoming more fluid in some ways, with less of a demarcation between 'incubation' and 'other' companies: again, counterintuitively, this fluidity is the result of a more structured triage assessment against Readiness Levels on a number of indicators, such as finance, IP, market understanding, etc (created by CPI). It is a holistic approach to innovation support, rather than acceleration or incubation, even though elements of these are incorporated into the design of the innovation infrastructure.

We have drawn up a skills programme which will develop NETPark as a touchpoint all the way from primary

school to executive education, including embedding an innovation module in courses at local colleges. We have relaunched our core message, refreshed the website and established a stakeholder communications protocol, forming closer links with national agencies, developing a twinning programme with other science parks and developing targeted inward investment activity to win new projects for us and our partners. And capital investment has been secured for infrastructure, grow on space, CPI's National Healthcare Photonics Centre, and CPI's National Formulation Centre.

In 2014, NETPark was 10 years old. This new core message has allowed us to develop a strategy for the next 10 years which will accelerate growth by bringing many different disciplines, technologies and market sectors together in a collaborative and supportive environment around one idea: the integration of materials into innovative products. This focus, combined with a determinedly outward-facing ethos, has allowed NETPark to become more integrated into wider economic development strategies.

NETPark as nexus for embracing innovation

It is important to remember that NETPark is one of many initiatives managed by Business Durham and these include inward investment, property, innovation, enterprise, and business engagement.

Building on the last 10 years of the development of NETPark and on the recently established realignment of its strategic specialisation, NETPark now has a new role to play in encouraging innovation as part of overall economic strategy. The realignment of focus for NETPark has enabled a more integrated approach to development strategies for County Durham.

An important part of Business Durham's remit is to make sense of a different kind of triple helix, or to 'square the triangle' of geography, sector, competence. This kind of triple helix is shown in Figure 3.

NETPark's place within this helix in encouraging and embedding innovation is central and four examples of strategies under development at time of writing are given to illustrate this role.

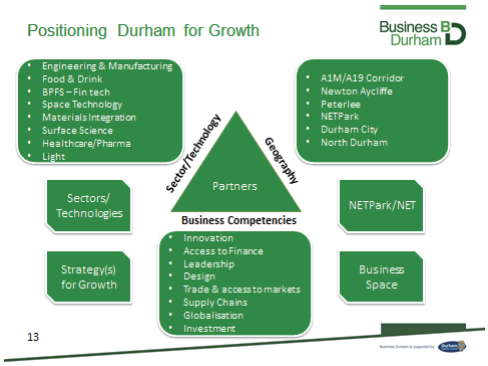

Figure 3: Geography, Sector, Competence (from the Business Durham Business Plan)

1. Manufacturing

County Durham has an exceptionally strong manufacturing base: it directly employs 15% of residents and accounts for 20% of our economy (35% if the demand by manufacturing for services is included). Aycliffe, 15 minutes away from NETPark, is the largest industrial estate in North East England, with over 250 businesses, almost all in manufacturing. Applying the principles of building business communities learnt at NETPark, Business Durham facilitated the creation of the Aycliffe Business Park Community to create a strong collective voice for the Park. This has also been applied in other areas of Durham.

In addition, Business Durham has now set up a public-private sector task force to examine how to build on this manufacturing strength and how to 'future-proof' the County's existing business base, considering the ever-shifting landscape: new markets are being opened up by the emerging economies, climate change and changing regulation, and demographic shifts such as the ageing population. Technology is driving

major change in mass personalisation, distributed production, and digitised manufacturing chains, and the global fragmentation of the value chain all present new opportunities for more export, inward investment and reshoring, the co-location of R&D with production, and potential "phoenix" industries. The import activity of companies can uncover opportunities for inward investment; if there are commonalities across the supply chains, a case can be made to create new activity within the County, near their markets. This might also create opportunities for indigenous companies to secure contracts and diversify.

NETPark is integral to this activity given that manufacturing is the entire value chain from ideation through to lifecycle management. Companies at NETPark occupy places at many points along this value chain. By being knowledge-driven and innovative, NETPark companies generate demand for 'traditional' engineering, design and prototyping skills as well as established volume manufacturing capabilities. They can also be suppliers of components into manufacturers. Arguably, most importantly, they act as pioneers for advanced manufacturing techniques in, for example, 3D printing and flexible electronics manufacture. Mapping the County's capabilities and how these can meet the needs of companies at NETPark, both now and in the future, will place NETPark at the heart of the manufacturing strategy and will ensure that as much value as possible is retained locally from the activities at NETPark.

2. Healthcare

Business Durham has been developing a healthcare offer for County Durham, working with many partners such as Durham University, CPI, the National Health Service and Durham County Council. County Durham has never had a proactive healthcare offer until now: the development of this was in part catalysed by the opportunities uncovered by NETPark's entry into the healthcare photonics market via the development of the Sleep Mask by PolyPhotonix. Looking at it from a different angle, the Sleep Mask does not just halt the blindness associated with diabetes, it radically improves quality of life, as blindness can be very isolating.

This starting point was quickly developed: we investigated the assets, funding opportunities, datasets, challenges, social drivers, public health statistics, policy drivers, research capabilities, and company capabilities in County Durham. The outcome is that we are now establishing the whole of County Durham as a living lab for companies to help us tackle the health consequences and causes of social isolation. Alleviating social isolation would transform the health of County Durham's communities.

We have adopted an integrated approach: economic performance is in itself a primary determinant of healthy communities so we have developed a targeted approach using economic development outcomes (attracting more companies, encouraging existing companies to diversify, creating new jobs) to effect transformative public health results. The opportunities to achieve both economic development goals and better health outcomes are multi-faceted: some of the most frequently health conditions associated with social isolation are malnutrition, dehydration, mental health, falls, heart disease, etc., and these can only be tackled with a combination of innovation in products and services across many different technology sectors. NETPark's role in this is fundamental, acting as a flagship for new products and services, attracting new companies, increasing existing companies' capability for innovation and giving them a hub for knowledge exchange and finding partners.

3. Durham City Investment Prospectus

Business Durham is leading a project to create an investment prospectus for Durham City. While at first glance this may seem completely unrelated to activity at NETPark, it is the intention to establish Durham City as a place to locate professional services: companies at NETPark rely on this sector to commercialise their products, requiring lawyers, financiers, etc. Aykley Heads is a particular site close to Durham City which is currently undergoing long term planning to become a business park, to be developed as a place for financial

technology companies, stimulated by the attraction to County Durham of Atom Bank, the world's first 'telepathic' bank. Given the planned growth of NETPark over the next 10 years, demand for this will only increase but NETPark is not intended for this kind of activity. Building a cluster of this activity at the Aykley Heads site can accommodate this demand. Figure 4 highlights the principal opportunities in Durham City.

Figure 4: Durham City opportunities

4. Light

Durham is having a year of light, taking advantage of the United Nations' International Year of Light to showcase a series of stories about light. Figures 5 and 6 are screenshots of the website, illustrating some of these stories: they range from the latest cutting edge research at Durham University to tackle counterfeiters to major manufacturers such as Thorn Lighting to Lumiere, the UK's largest light festival which happens in Durham every two years. Every month we release a new case study, building up a portfolio of stories with the message that Durham is a place of light.

Figure 5: Screenshot of Durham's Year of Light webpage

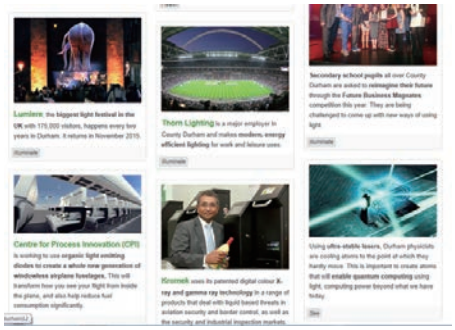

Figure 6: screenshot of some of Durham's light stories

While this is an interesting campaign to run in itself, it is also preparatory work for some highly targeted and focused inward investment activity based around positioning NETPark as the place for companies in healthcare photonics, with the construction of the National Healthcare Photonics Centre, due to open in 2017.

These are just some examples of how a refocused NETPark is enabling and underpinning economic development at different developmental stages throughout County Durham and across technologies, industries and communities.

Lessons learned

It is easy to forget that, at time of writing, we are in Quarter 2 of Year 1 of a brand new 10 year plan and it can appear daunting to put in place everything we need to implement as quickly as we would like. The lessons we have drawn from this process as it stands today are as follows.

· A strong key message is paramount: we had thought that our existing, physics-based technology focus was good but the idea of materials integration, while still only an idea, unleashed new thinking about potential opportunities in research, innovation infrastructure and skills, and has stimulated the development of even

more stakeholder confidence in NETPark's future growth.

· Partners are essential: there is simply no way we can deliver this on our own. The support from Durham University and CPI in developing the materials integration proposition was key and has helped shape joint activities.

· It took longer than we thought. Precisely because it stimulated so much more new thinking and a more creative approach to opportunities, the seemingly simple phrase "materials integration" took much longer than we thought to define and agree. We held back from redoing any communications materials until very recently to ensure that we had captured its true potential.

· Flexibility is important: other people took the idea, reshaped it into something better and gave it back. We could not be precious about protecting it and this openness has had some significant pay off in terms of connections.

· Chasing the money can be a distraction. NETPark has received significant funding in the past six months but the very fact that we took our time initially to hone the proposition has accelerated this at the right time.

· We have data and we are not afraid to use it: NETPark has had an evaluation framework in place since 2008. Most recently a statistic mapping the university collaborations at NETPark was transformed into an infographic which was released to the press and stakeholders. It generated nearly £50,000 Advertising Value Equivalent in column inches and made its way into a speech by the Minister for Small Business and Enterprise.

· Lastly, and most importantly, property is not enough. The catalyst for NETPark's growth was not having some buildings in a field; it was the focus on building a broad-based community based on innovation in science and being as outward facing as possible.

NETPark's journey from 'a couple of buildings in a field' to the nexus which underpins innovative activity and strategy throughout County Durham to encourage more and better industry, more and better jobs, looks inevitable with the benefit of hindsight. However, it has, in reality, been full of stops and starts, adapting to changing policy landscapes and changing markets. What we did well was to remain true to the vision and the ethos of absolute focus on science-based companies, to 'play nicely with others' and build strong partnerships and, now, to articulate more clearly NETPark's role in the wider economic development agenda. NETPark's journey has really only just started.

Conclusion

This paper started with a quote from Xiadong Zeng which summarised NETPark's function as the nexus of interconnected economic development strategies centred on innovation and dealing with technologies, industries and communities: 'If technologies are points and industries are lines, then communities are planes, and even multi-dimensional structures'.

The technologies (CdZTe, OLEDs, etc.) are clearly the points in this structure and the industries (design, engineering, software, manufacturing and professional services) are most certainly the lines along which the technology becomes a real product.

But it is in the communities, the planes, where we can see the real benefits of embracing innovation; whether it is creating new jobs for the communities in NETPark's locality, inspiring the scientists and entrepreneurs of the future to come from these communities, those communities all over the world which see advances in knowledge or huge improvements in quality of life from the products that are developed on site at NETPark, or because of NETPark's role as a beacon for innovation for the wider economic development agenda. This is the true benefit of embracing innovation: delivering real value and real benefit to people every day.