12TH APRIL 2017

SUBMISSION RESPONSE TO THE **INDUSTRIAL STRATEGY** GREEN PAPER

The Catapult Network
Joint Response

CATAPULT
Future Cities

EXECUTIVE SUMMARY

The Chief Executives of the Catapult network welcome the move to build a modern industrial strategy, with government playing an active role to back business, build on our strategic strengths and raise productivity to meet tomorrow's challenges, building a stronger and fairer economy that works across the UK. We believe that it is vital that the UK maintains and develops an effective translational infrastructure to be globally competitive

The Catapults were conceived against the long held notion that the UK, through its outstanding academic base, is a world leader in invention but often fails to capitalise on these strengths leading to the "invented here but commercialised abroad" syndrome.

The role of the Catapults is to provide support in carefully chosen technologies and sectors, to bridge the gap between early research and industrial commercialisation; to accelerate the exploitation of new technologies and developments by companies in the UK; to tackle barriers to commercialisation that are too large or too early for individual companies to address on their own; and of course to ensure that resulting jobs and innovation are anchored in the UK.

The unique status of Catapults as private, independent businesses led by industry professionals is the critical differentiator from the broader network of academic institutions, as it ensures that we operate at the demand end of technology commercialisation – enabling technology pull, rather promoting technology push. This is still a new mechanism for the UK, and indeed the world, but it is already clear it makes us very complementary partners for the existing actors in the landscape, including those linked to universities and research councils.

In 2015/16 alone, the longer established Catapults operated £850M of open access facilities across the UK; delivered 2,473 industry collaborations; supported 2,851 SMEs; and carried out 636 academic collaborations. We also reached out to 24 countries in our efforts to globalise innovation activity.

In addition to new and emerging technology and data based industries, the UK has large sectors with established industries dependent upon innovation such as aerospace, automotive, energy and life sciences. These sectors are themselves ecosystems of small and large firms with new firms often providing the disruptive technological leaps that can either displace incumbents or be the R&D departments for the industry.

Increasingly we will need innovative technologies, services and products to be integrated into complex inter-dependent 'systems' if we are to meet the challenges of tomorrow in areas like, future cities, clean energy and transport. As a network the Catapults are already playing a key role in fostering the cross-sectoral links and exchanges that are needed, helping to ensure that businesses and innovators understand strategic inter-dependencies, and where underlying capabilities have cross-sectoral applications. This function will be even more important in the future, and will help UK sectors to develop innovative integrated solutions that are better for consumers and more compelling as business propositions.

EXECUTIVE SUMMARY

We welcome the increased investment, particularly in the Industrial Strategy Challenge Fund on which we are working closely with Innovate UK. We are already involved in the ongoing reviews within life sciences, ultra-low emission vehicles, creative industries and industrial digitalisation with technology playing a fundamental role in changing these sectors. The network of Catapults set up since 2012 is already providing businesses with access to the best technical expertise, infrastructure, skills and equipment across the UK and promoting deeper collaboration between research and business. Uniquely, our success is measured through the impact we have on the sectors, institutions and companies we support, whilst our neutrality enables us to give unbiased expert advice and support. Through our work with industry in key sectors and technologies, the Catapults are today already delivering on the aims of the strategy as evidenced below.

We are very pleased to see that the first pillar of the Industrial Strategy is **investing in science, research and innovation**. As a network of technology and innovation centres we believe the Catapults play a unique role in building on the strength of our science base while delivering a step change in our ability to commercialise research. It is also important to acknowledge that much innovation now comes from innovative start-up companies as much as from university led research. Understanding how to leverage both will be key to strengthening both the UK's international competitiveness and our ability to address key societal challenges.

The Catapults are committed to helping to make the development and implementation of the Industrial Strategy a success. We will work as a network to learn from each other on what works best in supporting our science and business base to deliver genuinely innovative solutions into the market. We look forward to working with government on this, as key delivery partners, for a dynamic and innovative Industrial Strategy.

THE PILLARS

1. Investing in science, research and innovation – we must become a more innovative economy and do more to commercialise our world leading science base to drive growth across the UK.

Questions for consultation

5. What should be the priority areas for science, research and innovation investment?
6. Which challenge areas should the Industrial Challenge Strategy Fund focus on to drive maximum economic impact?
7. What else can the UK do to create an environment that supports the commercialisation of ideas?
8. How can we best support the next generation of research leaders and entrepreneurs?
9. How can we best support research and innovation strengths in local areas?

Response

We agree with the prioritisation given by Innovate UK to the sectors identified in the Industrial Strategy Challenge Fund, and would like to see cities and Advanced Urban Services included in the second round.

UK universities have some excellent Technology Transfer Offices (TTOs) and we encourage the sharing of best practice to help move ideas out into industry. We consider that the measurement of TTOs and the university system should be appropriately balanced towards both short and long term measures that reflect both income to the universities and impact on the economy. We encourage the interaction of TTOs with Catapults to enable spinouts to accelerate or become investable earlier.

The University Research System typically operates in Technology Readiness Levels (TRL) 1-4 with industry operating typically from TRL 7- onwards. Although both industry and the Research Council funded system do operate in TRL 4-7, this is the area in which the Catapults have set out to specialise.

2. Developing skills – we must help people and businesses to thrive by: ensuring everyone has the basic skills needed in a modern economy; building a new system of technical education to benefit the half of young people who do not go to university; boosting STEM (science, technology, engineering and maths) skills, digital skills and numeracy; and by raising skill levels in lagging areas.

Questions for consultation

10. What more can we do to improve basic skills? How can we make a success of the new transition year? Should we change the way that those resitting basic qualifications study, to focus more on basic skills excellence?

11. Do you agree with the different elements of the vision for the new technical education system set out here? Are there further lessons from other countries' systems?

12. How can we make the application process for further education colleges and apprenticeships clearer and simpler, drawing lessons from the higher education sector?

13. What skills shortages do we have or expect to have, in particular sectors or local areas, and how can we link the skills needs of industry to skills provision by educational institutions in local areas?

14. How can we enable and encourage people to retrain and upskill throughout their working lives, particularly in places where industries are changing or declining? Are there particular sectors where this could be appropriate?

Response

The longest established parts of the Catapult network exemplified by High Value Manufacturing Catapult (HVMC) have a deep skills agenda around the development of advanced manufacturing skills (advanced apprentices, degree apprentices and re-skilling). HVMC are working on this with EEF and TWI to deliver impactful schemes. HVMC has two major training centres of excellence so far with 750 apprentices in training. This model seems ripe for duplication, and some of the newer Catapults are now actively looking at how they can learn from and apply in their own sectors what has worked so well at HVMC.

In relation to the newer Catapults, many have adopted the process of "training through immersion" whereby a 2-3 year stint in a Catapult makes the individual highly valuable to industry, especially high growth industry, where skill deficits can be very acute. As an example, the Cell and Gene Therapy Catapult currently employs 130 people but has already lost over 40 people to industry. This covers the full range of expertise from scientists and regulatory experts through programme managers and senior managers. Whilst this can be difficult for Catapults to manage, it is creating a reputation in Industry that Catapults are a place to recruit industry-ready experts. The need for a deepening of the skills agenda in a specific sector is exemplified by the recent Advanced Therapeutics Manufacturing Task Force recommendations on skills and training which was built off data collected by the Cell and Gene Therapy Catapult.

In some markets, lack of knowledge within the potential customer base on how to buy and use new technology can be a major inhibitor. The collaborations that Catapults stimulate between potential customers and providers have been shown to be effective at bridging that gap and creating the necessary skills. Building on that, initiatives with standards organisations, for example Future Cities Catapult's collaboration with BSI on the Cities Standards Institute, create opportunities to upskill whole industry sectors, collectively.

3. Upgrading infrastructure – we must upgrade our standards of performance on digital, energy, transport, water and flood defence infrastructure, and better align central government infrastructure investment with local growth priorities.

Questions for consultation

As part of producing its National Infrastructure Assessment, the National Infrastructure Commission has issued a detailed call for evidence, seeking views from stakeholders on a range of questions about UK infrastructure policy. The National Infrastructure Commission's call for evidence is open until 10 February 2017. The questions below seek to complement this work.

15. Are there further actions we could take to support private investment in infrastructure?
16. How can local infrastructure needs be incorporated within national UK infrastructure policy most effectively?
17. What further actions can we take to improve the performance of infrastructure towards international benchmarks? How can government work with industry to ensure we have the skills and supply chain needed to deliver strategic infrastructure in the UK?

Response

It is important to both upgrade existing infrastructure such as road and rail, but also prepare for **next generation infrastructure**. The Catapults have a key role to play across the future UK infrastructure story, including the delivery of government aspirations like Digital Built Britain, in making real the efficiencies promised by whole-life management, in boosting the UK position on 5G, on renewable energy, on smarter city management, on electric cars, and connected and autonomous vehicles.

The work by Future Cities Catapult on Building Information Modelling (BIM); Digital Catapult on a 5G testbed and low power networks to support the Internet of Things; Offshore Renewable Energy Catapult's test and demonstration facilities for next generation wind turbines; Energy Systems Catapult's work with local authorities on spatial planning of low carbon energy solutions; and Transport Systems Catapult's work to put self-driving vehicles on UK public streets for the first time are all great examples of how Catapults are already supporting innovation underpinning the UK's future national infrastructure.

4. Supporting businesses to start and grow – we must ensure that businesses across the UK can access the finance and management skills they need to grow; and we must create the right conditions for companies to invest for the long term.

Questions for consultation

18. What are the most important causes of lower rates of fixed capital investment in the UK compared to other countries, and how can they be addressed?

19. What are the most important factors which constrain quoted companies and fund managers from making longer term investment decisions, and how can we best address these factors?

20. Given public sector investment already accounts for a large share of equity deals in some regions, how can we best catalyse uptake of equity capital outside the South East?

21. How can we drive the adoption of new funding opportunities like crowdfunding across the country?

22. What are the barriers faced by those businesses that have the potential to scale-up and achieve greater growth, and how can we address these barriers? Where are the outstanding examples of business networks for fast growing firms which we could learn from or spread?

Response

Catapults are running numerous programmes **supporting businesses to start and grow**. Commercialisation is not just about taking an idea from research and turning it into a product or service - it is also about helping companies to overcome the many barriers to entry and to understand potential markets and customers. Many of these programmes address critical cross-cutting issues such as information assurance, regulation, security and safety.

In the past year alone, the nine established members of the Catapult network have actively engaged with over 4,700 of the country's fastest growing and highest potential technology businesses. These are the companies at the 'bleeding edge', bringing the very latest technology into new global markets, and who face very specific challenges depending on the nature of the technology, and the market they are looking to enter.

For some businesses, it is strong incumbent suppliers and a complex regulatory environment that create the barrier. Catapults can help businesses quickly come to terms with relevant regulation, and by working with regulators develop new pathways and processes to get products to market quickly. A great example is the work the Cell and Gene Therapy Catapult carried out with the multiple regulators with jurisdiction over Advanced Therapies to streamline the process to significantly reduce the time taken to get approval to start a new clinical trial. This has moved both the perception and practice of the UK environment and regulators from "complex and uncertain" to "highly progressive."

For others, it is access to finance that is the issue. Lack of private venture funding for space businesses has long been a problem, owing to lack of space experience within the investor community, and misconceptions of high-risk, long timescales and low opportunity. This was an issue the Satellite Applications Catapult was keen to address, and set out to re-educate investors and unlock investment opportunities. To date, this has accounted for over £15M of private investment, and in November 2016, Seraphim Capital launched a £50M dedicated space fund backed the British Business Bank. Two other dedicated space funds have now also been announced, marking a distinct change in investor sentiment towards the sector.

All businesses want help reaching customers. The sector focus of Catapults gives them unparalleled insights into the way supply chains operate and evolve both in the UK and internationally. This knowledge is invaluable to supply-side companies, but also to those on the demand side who need help navigating the complex start-up landscape to reach the companies who can really help them. The Catapults have helped set up countless new partnerships up and down the country, enabling exports and inward investment overseas, both by facilitating introductions and through the establishment of longer-term R&D collaborations.

The Catapults have had both a direct and indirect role in forming spinouts in conjunction with universities and getting them to the point that they become investable.

5. Improving procurement – we must use strategic government procurement to drive innovation and enable the development of UK supply chains.

Questions for consultation

23. Are there further steps that the Government can take to support innovation through public procurement?

24. What further steps can be taken to use public procurement to drive the industrial strategy in areas where government is the main client, such as healthcare and defence? Do we have the right institutions and policies in place in these sectors to exploit government's purchasing power to drive economic growth?

Response

The need for government departments to innovate has never been higher. With the changes ahead, and the need to control public spending, all government budget holders are well aware of the pressure on them to get more value from the spending they control. Furthermore, the UK has some of the most famous public sector brands in the world: the NHS, The Metropolitan Police, the Ordnance Survey to name just a few. All businesses know that if they can sell their innovative products to these organisations, then the doors to new opportunities will open all over the world.

So the prospect of using public procurement to stimulate growth nationally, increase public sector productivity, and fuel export of innovative products and services globally is potentially enormous. All we have to do is help government itself become better at procuring such products from UK suppliers.

The Space for Smarter Government Programme (SSGP), run by the Satellite Applications Catapult in partnership with the UK Space Agency is an example of how Catapults can help. Similarly, a collaboration between Future Cities Catapult, Core Cities Group and Smarter UK is setting out how procurement by city administrations can better support innovative solutions. This sort of programme helps government buyers become more confident in the new capabilities they are buying, obviating the need for 'de-risking' provisions like the need for bidders to demonstrate existing customers (inevitably overseas) for the same service. So often, this sort of measure massively favours overseas companies who are serving their own governments, at the expense of British businesses who have better solutions more appropriate to the UK context.

6. Encouraging trade and inward investment – government policy can help boost productivity and growth across our economy, including by increasing competition and helping to bring new ways of doing things to the UK.

Questions for consultation

25. What can the Government do to improve our support for firms wanting to start exporting? What can the Government do to improve support for firms in increasing their exports?

26. What can we learn from other countries to improve our support for inward investment and how we measure its success? Should we put more emphasis on measuring the impact of Foreign Direct Investment (FDI) on growth?

Response

As the Catapults mature, we recognise the need to do more to encourage greater **trade and inward investment** to realise the full benefit from our science and technology base. We would welcome the opportunity to work more closely with Government on this.

Ever since the creation of Catapults, colleagues in UKTI and now DIT have been enthusiastic to use Catapults to support exports, and drive FDI. Catapults have contributed to dozens of trade missions, participated in many international collaborations (e.g. funded through Newton and other mechanisms) in countries including the US, Australia, Chile, Peru, India, Mexico, Singapore, Indonesia, Malaysia and The UAE. So successful have these collaborations been, that many countries are looking at emulating the Catapult model, including Australia, Thailand, Chile, China, France, and most recently Norway.

Similarly, Catapults have already been very successful at attracting inward investment. Of the 70 companies now established at Harwell around the Satellite Applications Catapult, one in three are inward investing companies. The recent announcement of a £20M investment by Boeing to establish alongside the Advanced Manufacturing Research Centre (part of the High Value Manufacturing Catapult) is a great indicator of how Catapults can build relationships over the long term. The recently announced investment by Thermo Fisher to establish a “cryo hub” next to

Cell and Gene Therapy Catapult's manufacturing facility in Stevenage for specialist shipping of living therapies shows a willingness to invest early as Catapults establish centres to provide infrastructure for firms to collaborate and scale up. We can expect more stories like this as other Catapults reach maturity.

7. Delivering affordable energy and clean growth – we need to keep costs down for businesses, and secure the economic benefits of the transition to a low-carbon economy.

Questions for consultation

27. What are the most important steps the Government should take to limit energy costs over the long term?
28. How can we move towards a position in which energy is supplied by competitive markets without the requirement for ongoing subsidy?
29. How can the Government, business and researchers work together to develop the competitive opportunities from innovation in energy and our existing industrial strengths?
30. How can the Government support businesses in realising cost savings through greater resource and energy efficiency?

Response

The Catapults in Offshore Renewable Energy and Energy Systems attest to ongoing commitments to address the significant challenges of producing and distributing affordable clean energy for the country. They are working hard to deliver innovation in risk averse sectors to help reduce consumer costs, make technologies more reliable and increase the level of UK content in high tech growth areas in energy which themselves can become export opportunities around the world. Catapults are ideally placed to fully understand market risk and how best to reduce it through innovation.

In addition, we have Catapults in Transport Systems and Future Cities, who have orthogonal and complementary views of the challenges of managing our energy infrastructure, and the problems associated with the use of current systems: most obviously, noise and pollution.

More broadly, the Catapults act as focal points for innovation in the energy sector, providing venues and sustained programmes of activity that bring together all actors from government, business and academia in support of collaboration and investment.

8. Cultivating world-leading sectors – we must build on our areas of competitive advantage, and help new sectors to flourish, in many cases challenging existing institutions and incumbents.

Questions for consultation

31. How can the Government and industry help sectors come together to identify the opportunities for a 'sector deal' to address – especially where industries are fragmented or not well defined?
32. How can the Government ensure that 'sector deals' promote competition and incorporate the interests of new entrants?
33. How can the Government and industry collaborate to enable growth in new sectors of the future that emerge around new technologies and new business models?

Response

One of the criteria for establishing Catapults has always been to focus on sectors where the UK can be genuinely world leading. Consequently, Catapults are naturally aligned with this pillar, and are all engaged in discussions around 'sector deals' to ensure that existing investments are well leveraged.

Our contribution to **cultivating world-leadership in sectors** includes the life sciences through the work of the Medicines Discovery Catapult supporting a multi-disciplinary community to find better, faster ways of bringing new medicines to patients, and the work of the Cell and Gene Therapy Catapult which has contributed to the establishment or growth of 50 small companies developing advanced therapies in the last four years. Cell and Gene Therapy is an important example of a sector that was very nascent until only a few years ago. We would encourage the Industrial Strategy to have equal focus on current world leading sectors as well as new and emerging sectors in which the UK has the potential for world-leadership.

9. Driving growth across the whole country – we will create a framework to build on the particular strengths of different places and address factors that hold places back – whether it is investing in key infrastructure projects to encourage growth, increasing skill levels, or backing local innovation strengths.

Questions for consultation

34. Do you agree the principles set out above are the right ones? If not what is missing?

35. What are the most important new approaches to raising skill levels in areas where they are lower? Where could investments in connectivity or innovation do most to help encourage growth across the country?

Response

Catapults were originally conceived to establish clusters in places with the potential to garner critical mass to support new sectors. This is still an important objective, yet the demand from some communities was quickly determined to be more distributed across the country, particularly for the non-vertical Catapults. The High-Value Manufacturing Catapult was created from day one as a network of seven pre-existing centres, arcing from the South West of England, up to the North East and Scotland, and the Offshore Renewable Energy Catapult has established presences in Scotland, the North East, Wales, the South West and is also supporting growth in renewables in Hull and the Humber region

To respond to the geographical spread of demand they saw, both Satellite Applications and Digital Catapults elected to create regional presences, to extend reach and broaden impact. These regional centres have been extremely successful; they are developing their own specialisms (eg cyber-security in Digital Catapult's Northern Ireland centre), and there is considerable interest in both growing the centres themselves, and broadening the network. Recently, in partnership with the UK Space Agency, the Satellite Applications Catapult extended its network covering the Midlands, North East and Scotland to include the South West (Exeter and Goonhilly) and South Coast (Portsmouth and Southampton).

Furthermore, projects undertaken by Catapults are themselves often delivered in real-world environments away from the centres – particularly those pertaining to cities, transport and rural communities. There are many examples of these projects that touch every part of the country.

10. Creating the right institutions to bring together sectors and places – we will consider the best structures to support people, industries and places. In some places and sectors there may be missing institutions which we could create, or existing ones we could strengthen, be they local civic or educational institutions, trade associations or financial networks.

Questions for consultation

36. Recognising the need for local initiative and leadership, how should we best work with local areas to create and strengthen key local institutions?
37. What are the most important institutions which we need to upgrade or support to back growth in particular areas?
38. Are there institutions missing in certain areas which we could help create or strengthen to support local growth?

Response

Creating the **right institutions to bring together sectors and places**. This is where the Catapults as a network are at their strongest. We are located across the UK building on clusters of scientific and industrial expertise to strengthen local innovation ecosystems. We are uniquely positioned to enhance local strengths and help regional businesses compete on the global stage, such that having a local Catapult is now seen as an essential boost to **regional innovation and growth**.

Although new Catapults build significantly on the expertise of the network, we propose exploring a model whereby new Catapults are more formally incubated from within the existing ones. This would ensure lower start-up costs and faster impact.

It is nonetheless important that these continue to be placed near clusters of expertise, that they are focused on sectors which offer the greatest opportunities to address societal challenges and that they are given time to achieve impact.

The Catapult network is established, gaining strength and represents a unique asset delivering impact across the full range of goals set out in the Industrial Strategy Green Paper. We are ready to play our role.

CATAPULT
Future Cities


futurecities.catapult.org.uk


@futurecitiescat