Department for
Business, Energy
& Industrial Strategy

Catapult Network Review

How the UK's Catapults can strengthen research and development capacity

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Foreword

It is evident from the findings of this review that Catapults play an important role in the research and development (R&D) ecosystem. They act as a bridge between the UK's research base and industry, building on commercial propositions in high potential sectors and technologies to create economic benefit for the UK, and supporting the Government's commitment to increase investment in R&D to 2.4% of GDP by 2027. It is vital that we make the most of these unique assets.

In January 2020, the Prime Minister announced that we would look at how Catapults can strengthen R&D capacity in local areas, improve productivity, and contribute to greater prosperity across the UK. In the R&D Roadmap, published in July 2020, the Government also committed to exploring options for building on the Catapults' existing performance to ensure the benefits they bring are felt in the local economies.

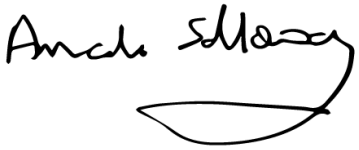
This review has highlighted the positive impact of the Catapult network to date, including their role in providing business support, establishing collaborations, providing access to finance, as well as their role in levelling up and skills development. It is essential we act on the recommendations in this review to ensure the Catapults can build on these strong foundations and continue to deliver support to UK innovation, sectors and industries.

As national assets grounded in regional ecosystems, Catapults have an important role to play in unleashing innovation, supporting the levelling up agenda and driving regional economic growth. They bring expertise into innovation clusters, supporting business growth, skills and international collaboration. Their presence in particular regions has delivered direct and indirect local benefits. They support the R&D ecosystem, collaborating with universities and businesses of all sizes.

We want to make the most of this as part of the wider innovation ecosystem. To do so, we must back Catapults to be a bridge between research and business in a way that is tailored to the sectors they work in. Catapults must collaborate with a range of partners and work together to tackle major challenges such as net zero. We must also ensure that more businesses have heard about, and are making the most of, the benefits that Catapults can have in different sectors and places around the UK.

This will enable Catapults to continue to deliver long-term benefit to the UK economy and accelerate economic growth in the sectors and technologies that they support.

I look forward to seeing the Catapult network continue to develop and flourish as we build on the UK's position a global leader in innovation.



Introduction

In January 2020, the Prime Minister announced that the Government would examine how the UK's Catapults[1] can strengthen research and development (R&D) capacity in local areas and how they can improve productivity and contribute to greater prosperity across the UK.

The Department for Business, Energy and Industrial Strategy (BEIS) has developed a set of recommendations. These are based on a series of stakeholder round tables and one-to-one interviews, internal workshops with BEIS, UKRI including Innovate UK, and responses to the R&D Roadmap survey. These recommendations build on the positive work and impact of Catapults to date and focus expanding their impact, operational effectiveness, and the next steps that could be taken to strengthen the network.

Aims and scope of this review

Following the Prime Minister's announcement, this review set out to establish:

- What impacts Catapults are having on their sectors, policy and local areas;
- Whether performance management currently best drives impact; and
- How Catapults can improve productivity and prosperity across the UK.

This review specifically explored:

- How Catapults support the commercialisation of research and support innovative companies;
- How Catapults can operate as effectively as possible, and collaborate with a range of partners;
- How Catapults can support current Government priorities.
- How monitoring and evaluation can be improved to ensure that the impact of Catapults is accurately reflected; and
- How decisions should be made on evolving the Catapult network in the future.

The review did not seek to question the original purpose of the Catapults, nor did it look at their individual performance which is monitored by Innovate UK as part of their quarterly reporting cycle.

[1] Science and Innovation Press Release. 27 January 2020.

Review Process

The review was conducted by BEIS in two stages.

Stage 1 of the review ran from January until March 2020. It consisted of two parts:

1. A review of performance reports, delivery plans, annual reports, impact assessments, case studies and international comparators; and
2. Interviews with stakeholders including businesses, universities, government departments, Local Enterprise Partnerships, UKRI, Innovate UK, and the Catapults.

Stage 1 was used as a preliminary process to draw out key themes, which were used to inform Stage 2. The themes identified were place, funding, skills, changes to the network and new opportunities, working as a network, and performance metrics. The review was then paused as the Government and the Catapults diverted resource to the Covid-19 response.

In the interim, the Government published the July 2020 R&D Roadmap. It emphasised the need to leverage the UK's innovation infrastructure, which includes the Catapult network. This committed to exploring options to ensure the benefits Catapults bring are felt in the local economies. The Roadmap also committed to expanding the delivery of learning and training across UKRI's network of institutes, including Catapult centres.

Stage 2 of the review ran from July to December 2020. It aimed to examine the themes identified in Stage 1 and understand how the UK can make best use of Catapults to deliver for UK businesses, the economy, and the Government's levelling up agenda. During Stage 2, we spoke to numerous stakeholders and collated relevant responses to the R&D Roadmap survey. These were used as evidence, along with evaluations and case studies, to inform our recommendations.

Summary of Recommendations

The Catapults support innovation through the provision of R&D infrastructure, specialist knowledge and expertise, partnership and collaboration building capabilities and business support. Since 2011, Catapults have directed over £2.5 billion of private and public sector investment to support innovators and advance the UK's economic capability in cutting-edge global markets. They have established over 2,000 academic collaborations, 14,750 industry collaborations and supported in excess of 8000 small and medium sized enterprises (SMEs).[2]

This review has explored the impact of the Catapult network to date and its recommendations are intended to ensure the Catapults continue to deliver vital support to UK innovation, sectors and industries.

A critical part of the UK's innovation ecosystem

The UK's innovation ecosystem benefits from having Catapults that bridge the gap between research and business. Catapults are unique institutions in the UK R&D system; businesses and stakeholders are positive about the difference they make. They are a critical part of a wider system of innovation in which universities, businesses, institutes, private investors and many others play important roles. Their impact varies, with the longest established having the greatest impact as measured by private investment and business partners – suggesting there are benefits to giving them time to establish themselves in particular sectors.

Recommendation 1: Catapults fill a gap in the UK innovation ecosystem and should focus on the core objectives established in 2010. Our focus now, drawing on the findings of the 2014, 2017 and this review, will be on moving away from extensive reviews and instead on supporting them to be more effective institutions.

Recommendation 2: As part of the forthcoming Innovation Strategy, BEIS should work with UKRI and partners across government, business and academia to consider the strengths and weaknesses of the UK's innovation ecosystem as a whole, and how we make the most of Catapults as a critical part of that, ahead of funding decisions at the 2021 Spending Review.

Governance and evaluation

The Catapults need sustainable governance and consistent review processes that are not updated during every funding cycle. This review recommends that Innovate UK / UKRI agrees with BEIS a clear, consistent 5-year review cycle which builds in expert review panels, and that this is maintained.

Recommendation 3: Innovate UK / UKRI should incorporate independent review panels into the funding renewal process for 2023, which will begin during 2021.

[2] Catapult Network: Creating the future through innovation. 2020.

Subsequently, this process should be refined and built into a consistent 5-year review cycle run by UKRI / Innovate UK to provide evidence for long-term funding decisions.

Recommendation 4: BEIS, Innovate UK and the Catapults will work together to ensure that appropriate data is being collected to provide robust evidence of impact. As part of the 5-year review cycle, BEIS and Innovate UK will work towards agreeing bespoke KPIs with the Catapults that reflect the individual nature of each Catapult, alongside a core set of common KPIs.

Catapult Collaboration and Competition

In order to achieve their purpose, it is vital that Catapults collaborate effectively with universities, businesses, and each other. Where Catapults have been most successful, it is in supporting innovation at mid-to-high Technology Readiness Level (TRL), growing sectors, providing expertise and guidance on private and public funding, and establishing unique collaborations.

Noting that each Catapult is unique, and that the same model will not necessarily work for all Catapults, this review is recommending that the Catapults should each review their engagement with universities and support for helping businesses to access finance. While the Catapults' funding model is necessary to ensure an appropriate range of activities, the review also finds that the Catapults should introduce a code of practice to disincentivise competition with their own sectors or technology domains, and have a transparent and robust process for handling complaints.

Recommendation 5: The Catapults should each review whether their engagement with universities is benefitting their sector or technology and meeting their original purpose to bridge the gap between research and industry, and whether such engagement could usefully be expanded to a wider range of universities

Recommendation 6: Catapults should share best practice across the network supported by UKRI / Innovate UK, including on supporting companies to access finance. All Catapults should seek to proactively broker introductions with investors.

Recommendation 7: UKRI / Innovate UK should review their funding rules to ensure they allow Catapults to collaborate on projects of mutual interest to the network, and evaluate how effectively Catapults are collaborating as part of monitoring and evaluation.

Recommendation 8: The Catapult network should develop a code of practice that provides greater transparency over how they make decisions on competing for commercial work and collaborative R&D (CR&D). Catapults should have a transparent and robust framework in place to address concerns raised by external stakeholders.

What next?

This review has considered whether the Catapults should be expanding their remit or core objectives in line with Government priorities on levelling up, talent, and culture.

Catapults should continue to be national assets that deliver long-term benefit to the UK economy and accelerate economic growth in their sectors or technology domains. However, this review recommends that the Catapults consider whether their overall strategy to deliver national benefit could do more to support new innovation clusters and local economies, as spill-over benefits.

In line with earlier recommendations from Dr Hermann Hauser, and stakeholder feedback, Catapults should use their unique convening role to identify and address skills gaps where this does not compromise their core objectives. We recognise that Catapults are not currently funded to fulfil this role and will consider whether funding can be made available through future fiscal events.

In April 2019, the Catapults made a commitment to embedding diversity and inclusion at all levels, but it is not clear that they are delivering on that commitment. This review recommends that that, as role models to the innovation community, the Catapults visibly reconfirm and publicise their commitment to diversity and inclusion, including addressing inequality.

When the Catapults were set up in 2011, Dr Hermann Hauser envisaged that the Catapult network would continue to expand year on year. This report recommends that Innovate UK / UKRI should use its existing criteria to assess whether new Catapults should be opened in the case that appropriate funding becomes available.

Recommendation 9: Catapults should look for opportunities to support local economies, work with local partners and build innovation clusters as part of their overall strategy to support their sector or technology, and report on progress as part of their five yearly reviews. The Innovation Strategy and R&D Places Strategy should consider how to make the most of Catapults' local impact.

Recommendation 10: Catapults should identify whether they can introduce skills development into the next 5-year review cycle in a way that works for their sector, considers Catapult maturity, and does not compromise core objectives.

Recommendation 11: The Catapult network should reconfirm its commitment to embedding EDI at all levels and in all the Catapults do, including monitoring diversity and publicising their work on EDI.

Recommendation 12: Innovate UK will use existing criteria, updated to reflect the recommendations in this review, to assess whether new Catapults should be opened if appropriate funding is available.

Recommendation 13: BEIS will work with Cabinet Office to provide best practice guidance for Government Departments on contracting and engaging with Catapults.

Background and context

Catapults are independent, not-for-profit organisations designed to support innovation through the provision of R&D infrastructure, specialist knowledge and expertise. They build capability through partnership and collaboration and provide business support that may not be available due to market failure, commercial risk, or inhibitory costs. There are nine Catapults (see Annex A). Catapults receive some core funding from BEIS, through Innovate UK (part of UKRI), which has a close relationship with the Catapults as their sponsor. BEIS advises Ministers on the overall level of investment.

Catapults were established in 2011 following Dr Hermann Hauser's review of the role of technology and innovation centres in the UK.[3] Based on twelve international comparisons[4], Dr Hauser recommended that the UK establish and fund a network of technology and innovation centres in areas where the UK had the potential to gain substantial economic benefit. The centres were to provide businesses and academia with access to technical expertise, skills, infrastructure and equipment so that they could commercialise innovative ideas and research.

Based on criteria set out in the Technology Strategy Board's (now Innovate UK) 2011 strategy and implementation plan,[5] Catapults were established where:

- global markets were predicted to reach billions of pounds per year;
- the UK had world-leading research capabilities;
- UK businesses could exploit technology and investment to capture a significant share of the value chain;
- there was capacity for the UK to attract and anchor knowledge intensive activities of globally mobile companies and create sustainable wealth for the UK; and
- there was close alignment with national strategic priorities.

How do Catapults differ from Herman Hauser's original vision?

In 2014, Dr Hauser was commissioned to review the Catapult network's progress and the potential scope and scale of the network.[6] He reiterated the role of the Catapults as an intermediary between research organisations and industry, with a unique (to the UK) funding structure that allows them to focus on more risky, emerging technologies or sectors than capital constrained, not-for-profit organisations. Dr Hauser concluded that the Catapults were mirroring international comparators, and valued by customers. He said it was too soon to show

[3] Herman Hauser. The current and future role of technology and innovation centres in the UK. 2010.
[4] Germany; South Korea; Sweden; France; China; Denmark; USA; Japan; Singapore; Israel; Belgium, and the Netherlands.
[5] IUK Implementation Plan. Technology and Innovation Centres: Closing the gap between concept and commercialisation. 2011
[6] Review of the Catapult network: recommendations on the future shape, scope and ambition of the programme. Hermann Hauser. 2014

evidence of long-term impact, but early indications were that the more mature Catapults were driving significant investment in innovation.

In 2017, in the run-up to an anticipated Spending Review, BEIS also commissioned an independent review of the Catapult Network by Ernst and Young (EY), focussing on their performance.[7] The review noted the hugely complex nature of establishing Catapults due to the substantial, long-term investment required, the number of stakeholders involved, and the scale of the change they were expected to deliver. It highlighted the Catapults' notable achievements in contributing to innovation outcomes and made recommendations on strategy, governance, performance management, funding, economic impact, and operation. A key recommendation was for more robust governance to provide assurance that the Catapults were delivering according to their core objectives and purpose. It was recommended that key performance indicator (KPI) based performance management was embedded into Catapults to monitor this.

The overarching objectives of the Catapults have not changed substantively. Since 2018, when the five-year budget (2018-2023) for the Catapult network was approved, the objectives have been to:

- work with industry and regional, national and international partners, to commercialise innovation in a way that drives long-term benefit to the UK economy;
- provide businesses with access to the appropriate mixture of expertise facilities and equipment needed for them to invest in innovation where these are not readily available due to market failure or commercial risk;
- work collaboratively together and with the wider R&D ecosystem to enable the development of innovative solutions to overcome key challenges; and
- take an active role in removing industry-wide barriers to innovation and commercialisation where they exist.

[7] 2017 EY Catapult Network Review

Findings and Recommendations

A critical part of the UK's innovation ecosystem

Catapults are unique institutions in the UK R&D system, and businesses and stakeholders are positive about the difference they make. We have collected extensive feedback on the Catapults, both directly through this review and through the R&D Roadmap survey, which elicited over 400 responses.

The significant majority of feedback that we received on the Catapults was positive. This was notable in the R&D Roadmap survey, where we did not specifically ask about the Catapults. The positive feedback spread across the whole spectrum of respondents, including SMEs, large R&D intensive companies, universities, and government agencies. Much of it noted the general success of the High Value Manufacturing Catapult specifically, indicating that the Catapult has built a strong brand.

There is some evidence that Catapults need to increase their visibility; some SMEs in IT, electronics and business services have indicated that the Catapults need to do more to promote their offering and make sure the Catapults are accessible to smaller partners.

The only concern raised by multiple stakeholders was that the Catapults sometimes compete for work against their sectors. This was raised by small businesses with respect to commercial work, and universities with respect to collaborative R&D (CR&D) funding. This is an unintended consequence of the Catapults' funding model, which is a fundamental part of driving the Catapults' role as a bridge between research and business. In recommendation 8, we propose that the Catapults could use a code of practice as a soft measure to address this problem.

But they are just one part of a wider system of innovation in which universities, businesses, institutes, private investors and many others play important roles. Their impact varies. The High Value Manufacturing Catapult generated 75% of all of the Catapults' income in FY19/20. It is the longest-running and the largest Catapult. It is one of only three Catapults that brings in more money (£212m) than it receives in core funding (£128m). The Catapult was established in 2012 but its constituent centres have been around a lot longer (the Warwick Manufacturing Group was established in the 1980s, the Advanced Manufacturing Research Centre (AMRC) was established in 2001). There is also a correlation between the age of the Catapult and its performance in bringing in leverage from Business investment in R&D, suggesting it may take more than 10 years for a Catapult to 'mature'.

Our findings suggest that Catapults play a unique role in the system that stakeholders value, that their impact varies by sector and by time established, and that they are one, critical, part of the innovation ecosystem. As part of the forthcoming Innovation Strategy looking across the UK innovation ecosystem, we should consider the role of Catapults within the wider system, including within places. We should make the most of them as institutions, without asking them to carry the full weight of the innovation ecosystem – and we should give them the time to

develop, while still having regular assessments of performance tailored to sector (see section below).

The role of Catapults

The core objectives for the Catapults were established in Autumn 2010 when the Government provided over £200 million of additional funding to Innovate UK to establish seven Catapults. It clarified the role of Catapults would be to:

- Enhance business access to leading-edge technology and expertise
- Reach into the research base for world-leading science and engineering
- Undertake collaborative applied research projects with businesses
- Undertake contract research for businesses
- Be strongly business-focused with a highly professional delivery ethos
- Create a critical mass of activity between business and research institutions
- Provide skills development at all levels.

Recommendation 1: Catapults fill a gap in the UK innovation ecosystem and should focus on the core objectives established in 2010. Our focus now, drawing on the findings of the 2014, 2017 and this review, will be on moving away from extensive reviews and instead on supporting them to be more effective institutions.

Recommendation 2: As part of the forthcoming Innovation Strategy, BEIS should work with UKRI and partners across government, business and academia to consider the strengths and weaknesses of the UK's innovation ecosystem as a whole, and how we make the most of Catapults as one part of that, ahead of funding decisions at the 2021 Spending Review.

Governance and Evaluation

Reviews

Throughout this review, the Catapults have mentioned the challenges of multiple reviews by the Government; different forms of review have been conducted in 2014, 2017 and 2020-21. This was also raised by most witnesses in the recent inquiry by the House of Lords Science and Technology Select Committee: “Catapults: bridging the gap between research and industry”[8].

It is good practice for the Government to examine the performance of the institutions that it funds. However, this should be achieved through consistent governance structures and review processes. The Government needs to get these structures and processes right, so that they are sustainable and do not need to be repeatedly updated. They should allow the Government to assess how individual Catapults are performing and give each individual Catapult the opportunity to demonstrate that it is making a lasting contribution appropriate to its specific sector or technology.

Expert evaluations are an established way of evaluated the performance of research institutions, for example the Laboratory of Molecular Biology, Cambridge are evaluated in this way. The expert evaluations could be emulated for the Catapults.

[8] Science and Technology Committee. Catapults: Bridging the gap between research and industry. 2021

Case Study: how do Catapults compare to Fraunhofers?

Fraunhofer-Gesellschaft in Germany has a headquarters with over 1000 staff, which centrally manages corporate functions for the Fraunhofer institutes, including HR, contracting, and marketing.

Unlike the Catapults, individual Fraunhofer institutes do not have a direct relationship with the German government. Whereas Innovate UK allocates budget to each Catapult, Fraunhofer-Gesellschaft HQ negotiates its overall budget with the Government, then uses an algorithm to allocate core funding annually to each institute. This algorithm accounts for factors such as number of employees, industrial income, and EU income.

While the Fraunhofers and Catapults both use a funding model where approximately one third or their funding should come from – respectively - public funding, commercial work, and collaborative R&D, this is implemented differently. The 'thirds' model is aspirational for the Catapults, but the Fraunhofer algorithm is finely tuned to incentivise the right amount of industrial work – too much or too little will result in less government funding.

The Fraunhofers are fully evaluated every five years using expert panels. Each institution writes a detailed document explaining its technical strategy along with commercial, financial and other information. The document is shared with two industry and two academic experts, who then hold an in-person evaluation with the Fraunhofer over several days. If a Fraunhofer is considered not to be performing well enough, Fraunhofer-Gesellschaft can put it on special measures to help it improve. When a Fraunhofer is performing well, its annual budget will be set using the algorithm and it will be left for the year to deliver its strategy.

This differs from the Catapults, which are given a 5-year funding agreement by Innovate UK, based on a strategy and delivery plan. The Catapults then report quarterly against their KPIs and these quarterly reports can be used to trigger enhanced performance management if necessary. In 2017, Innovate UK used review panels to assess the seven longest-established Catapults, which supported 2018-2023 funding decisions, along with economic evaluations. This review process has not been formally embedded into Catapult evaluation.

A key lesson from the Fraunhofers is that formal governance, monitoring and evaluation do not need to constrain organisations. While the Fraunhofers are subject to annual budget reviews, these can be done in a single day and are part of a clear and consistent process. The five-yearly evaluations genuinely help the Fraunhofers assess and improve their own performance through the involvement of academic and industry experts. Fraunhofer-Gesellschaft has put governance and systems in place that finely tune the tensions between the Fraunhofers' work with industry and universities, so that the benefits are realised without barriers being introduced.

Neither Innovate UK nor the Catapult network are resourced to fulfil a Fraunhofer HQ style function, including for assigning annual budgets, however, we should still look emulate the clear brand Fraunhofers have established. One of the core purposes of the Catapult Network Office, which was created by the nine Catapults and initiated in 2019, is to develop and promote the network. Once more mature, this Office should help strengthen the brand of the network leading to increased power of influence and recognition, increased power to galvanise stakeholders, and an improved ability to win strategic funding.

Recommendation 3: Innovate UK / UKRI should incorporate independent review panels into the funding renewal process for 2023, which will begin during 2021. Subsequently, this process should be refined and built into a consistent 5-year review cycle run by UKRI / Innovate UK to provide evidence for long-term funding decisions.

KPIs, Data collection, and Impact Evaluation

Monitoring and evaluation are critical to ensuring that public funds are spent appropriately, and funding decisions are based on evidence. As a general principle, KPIs should track impact and align activities with objectives. Similarly, consistent, business level and high-quality data is needed to track progress and support robust evaluation.

Different approaches have been taken to KPIs for the Catapults. Dr Hauser recommended sophisticated KPIs to incentivise impact and engagement with industry, noting that it would be difficult to have generic KPIs across such a diverse network. Conversely, EY recommended simpler KPIs and their report resulted in eight common KPIs across all Catapults. These core KPIs emphasise short-term progression of generic activities and stakeholders have raised concerns that they do not allow for assessment of impact.

How Catapult performance is managed by Innovate UK

Catapults are funded to deliver an agreed set of outputs and outcomes over a five-year period which Innovate UK monitor progress towards using milestones and key performance indicators as well as narrative reporting. There are formal quarterly review meetings including the Catapult CEO and an Innovate UK director. If a Catapult has missed targets, or Innovate UK has other evidence that the outcomes are at risk the grant funding agreement includes a rectification process focused on supporting the Catapult to achieve the outcomes but ultimately enabling withdrawal of funding in extreme circumstances.

On an annual basis, the Innovate UK Executive Management Team reviews any proposed changes to Catapult outcomes. The Executive Chair meets with each Catapult chair to review the effectiveness of the Catapult's governance in relation to the grant.

Monitoring and evaluation help the Government to understand which activities work and whether programmes are meeting their objectives. Although Dr Hauser has noted the difficulty in linking Catapult activities to sector growth, he has also said that data from businesses working with Catapults is needed to assess early outputs. Surveys, case studies, and stakeholder feedback have provided evidence of the Catapults' beneficial impact.

However, stakeholders have told us that evaluations do not reflect the Catapults' full impact and that quantitative assessments are not well-evidenced. Catapult evaluations have suffered from a lack of good quality data, which means that the evaluations cannot be considered a reliable measure of impact. Action to improve data collection across the Catapults is vital to support future investment decisions and ensure value for tax-payers' investment.

Recommendation 4: BEIS, Innovate UK, and the Catapults will work together to ensure that appropriate data is being collected to provide robust evidence of impact. As part of the 5-year review cycle, BEIS and Innovate UK will work towards agreeing bespoke KPIs with the Catapults that reflect the individual nature of each Catapult, alongside a core set of common KPIs.

Catapult Collaboration

Commercialisation of research is a core role of the Catapults, which requires them to facilitate collaboration between universities and businesses. Increasingly, as the UK seeks to address complex societal and global challenges such as net zero, the Catapults can also benefit from collaborating with each other.

When the Catapults were established, Dr Hauser emphasised the need for translational infrastructure to help bridge the gap between early-stage research and the later stage industrial commercialisation. In 2014, he recommended that Catapults develop a stronger model for working with universities, to help draw on and commercialise research that will help give the UK industry a competitive advantage.

Working with universities

Throughout this review, stakeholders have told us that Catapults play an important role in helping to bridge the valley of death[9], providing support across TRLs four to seven through access to equipment and skills, and helping to shape policy and regulation to help innovative companies. However, some stakeholders have told us that Catapults need to engage better with universities so that they can identify and support ideas that need their feasibility demonstrated before a service or technology can be developed.

[9] 'Valley of death' usually refers to TRLs 4 – 7, and the well-documented struggle that companies face in shifting products and services from development to commercial use.

In their inquiry into Catapults, the House of Lords recommended that UKRI foster closer links between industry and universities and allow Catapults and universities to work together more easily on innovation projects.

Case Study: Offshore Renewable Energy Research Hubs

As part of its Academic Engagement Plan, the Offshore Renewable Energy Catapult have created Research Hubs, designed to align Catapult facilities with UK academic expertise to support the needs of the offshore renewables industry. The Hubs establish focused, flexible and competitive networks with leading UK universities, that address the sector's biggest challenges, including turbine blade, electrical infrastructures and powertrain technologies. The Hubs also support up to 40 PhD students.

Catapults' relationships with universities vary across the network. Some have deep ties with specific universities, such as the Compound Semiconductor Applications Catapult with Cardiff University. This is closest to the Fraunhofer model, where every institute is attached to at least one university. Other Catapults engage with universities ad hoc. Although Catapults should take an approach appropriate to their specific sector or technology, we note that businesses and academics have repeatedly told us that Catapults can create the greatest leverage of UK strengths by developing strong links with universities.

Case Study: LUNAC Therapies

LUNAC therapies, a drug spin-off from the University of Leeds, in partnership with the university and the Medicines Discovery Catapult secured a £5.79m of funding to develop an innovative anti-coagulant treatment that will better meet patients' needs. The funds were raised through series A investment and Innovate UK's Biomedical Catalyst fund, with the Catapult playing an important role in supporting LUNAC with business and investment planning.

Recommendation 5: The Catapults should each review whether their engagement with universities is benefitting their sector or technology and meeting their original purpose to bridge the gap between research and industry, and whether such engagement could usefully be expanded to a wider range of universities. BEIS will work with Innovate UK / UKRI, Catapults, universities, and representative organisations to actively promote new connections, and best practice should be shared between Catapults.

Working with businesses

Catapults stimulate private investment by acting as centres of expertise which attract innovative companies to develop their products and services. Companies either pay to work with Catapults or work on joint projects with public funding. Typically, smaller companies are more dependent on winning public funding and larger companies can also afford to work directly with Catapults.

Catapults provide tailored support to SMEs and start-ups, with advice and toolkits that include support for products, processes, workforce development, investment, and routes to export. Catapult staff proactively engage with businesses and advise them on how to overcome barriers.

Large companies and SMEs have both noted the value of skilled Catapult staff and facilities, and highlighted the importance of Catapult guidance on public and private funding options. Stakeholders have told us that a number of projects would not have been possible without Catapult facilities and equipment, for example, the High Value Manufacturing Catapult's world-first FutureForge facility is helping companies of all sizes explore less energy intensive forging methods; and the Offshore Renewable Energy Catapult's test facility at Blyth, provides research, test, innovation and validation services to accelerate the deployment of offshore renewable energy technologies. Businesses have also highlighted that the Catapults' networking and business advice has encouraged new partnerships.

Case Study: Stream Bio

Stream Bio invented Conjugated Polymer Nano Particles™, a new generation of molecular bioimaging probes that could save millions of lives by improving diagnostics and therapeutic targeting. The High Value Manufacturing Catapult's Centre for Process Innovation played an important role in moving the product from a research idea to a commercial reality in under two years through the provision of expertise, access to facilities and equipment, as well as business development advice on Intellectual Property protection and business modelling. The business is now developing eight further products.

Case Study: The Living Lab

With around 40% of the UK's greenhouse emissions coming from homes, Energy Systems Catapult has developed a 'Living Lab' - a real-world test environment of over 200 digitally connected homes. The facility enables innovative businesses to rapidly design, market-test and launch their smart energy innovations with real people. It also provides a national capability to test and demonstrate new market arrangement, policies, and regulations with real consumers. Such collaborations could lead to outcomes including innovative ways to retrofit homes for net zero, making homes warmer, lowering energy bills and improving health outcomes.

Stakeholders have told us that Catapults have varying methods for, and success at, helping businesses to access finance. This is in part due to the different maturities of the Catapults and differences between the sectors that they serve. Some Catapults have their own investment models, for example the Satellite Applications Catapult and the Centre for Process Innovation. Where Catapults do take a proactive approach, feedback tells us that this can help potential investors understand how their investments in new ideas could make returns.

Case Study: Seraphim Space Fund

The Satellite Applications Catapult has partnered with the British Business Bank and leading space and data analytics multinationals to support Seraphim Capital, a London-based venture capital fund manager, to launch the Seraphim Space Fund. It is the first fund of its size anywhere in the world, reaching £70 million on its second close in 2017. The Catapult has supported the fund's activities, leveraging its network and leading role in the space and satellite applications start-up ecosystem in the UK.

Overall, Catapults are delivering on their objective to support businesses through unique capabilities. The only area of inconsistency is in supporting access to finance.

Recommendation 6: Catapults should share best practice across the network supported by UKRI / Innovate UK, including on supporting companies to access finance. All Catapults should seek to proactively broker introductions with investors. For example, regular meetings of Business Angels, Venture Capitals and Corporate Venture Capitals could be set up around each Catapult. We suggest that the Catapults work with other actors in this area, such as the British Business Bank and Innovate UK Innovation Loans.

Network Collaboration

In exploring how Catapults can operate more effectively as a network, we have heard that funding rules can act as a barrier to cross-Catapult collaboration, and that the Catapults have rarely been incentivised by the Government to work together.

Collaboration between technology centres can bring clear benefits. This is demonstrated in the Fraunhofer system, where the central headquarters can quickly convene expert groups which can give the Fraunhofer Institutes competitive advantage[10]. Although the Catapult brand was established to provide a clear corporate identity and common vision, the government has never required a formal network function.

Catapults are already internationally recognised and respected, with significant networks and activities overseas, though the level of international activity varies considerably by Catapult. Catapults have acted as delivery partners for Official Development Assistance (ODA) R&D programmes such as the Newton Fund (see case study below), leveraging their technological capabilities, domestic networks and international networks to establish effective collaborative programmes. Greater flexibility in CR&D funding could enable Catapults to deliver such programmes on a more frequent and systematic basis.

Stakeholders have stressed the importance of Catapults working together to spot cross-sectional opportunities, close knowledge gaps, share best practice and build their brand. The Catapults recognise this point. In 2018, they jointly formed and funded the Catapult Network

[10] Institutional Comparison of Five Institute Systems. 2008

Office, which coordinates activity across the network. It drives cross-Catapult coordination and collaboration, including promoting best practice and knowledge sharing between Catapults, and can support the network to respond to challenges. For example, Net Zero has incentivised a cross-Catapult collaboration to create a roadmap on commercialisation of missing technological innovations. However, there are more opportunities for collaboration and sharing of best practices across the network. Stakeholders have identified obvious synergies between Catapults, for example Cell and Gene Therapy, Medicines Discovery, and Digital.

Catapult Network Office

The Catapult Network Office's original core objectives are to:

- Develop and promote the Network value
- Communicate the Network proposition through a single voice to key stakeholders
- Interact with Innovate UK/ UKRI and key stakeholders at Network level
- Drive cross-Catapult coordination, cooperation and collaboration
- Promote knowledge sharing and best practice.

After almost two years in operation, these objectives will be reviewed in order to extract the most benefit from the activities of the Network Office as it evolves. The Network Chair will also set specific annual objectives aligned with the latest key priorities, as they arise.

Case Study: Fit 4 Offshore Renewables

Fit 4 Nuclear was launched by the High Value Manufacturing Catapult's Nuclear Advanced Manufacturing Research Centre (NAMRC) as a unique service to prepare companies to bid for work in the nuclear supply chain and support them in addressing gaps where they emerge. Responding to the success of this programme, NAMRC supported the Offshore Renewables Catapult in the design of its own Fit 4 Offshore Renewables (Fit4OR), modelled on Fit 4 Nuclear. Delivered in collaboration between the two Catapults, the programme will support UK SMEs to maximise opportunities in expanding the offshore renewables sector in the UK and globally.

For specific projects, Catapults can be constrained from collaborating with each other. Only 30% of any Innovate UK CR&D grant is available to academic and Research and Technology Organisations (RTO), to ensure that the grants primarily support businesses. This can prevent more than one RTO joining a collaborative bid.

Overhead recovery in CR&D can also limit the Catapults. Catapults typically get 20% recovery of overheads, while universities get 80%. CR&D therefore draws on the Catapults' core and commercial funding, effectively limiting their participation in collaborative projects.

Case Study: Innovating for Clean Air, India

Cities worldwide are struggling with air pollution, enabling the increase of Electric Vehicles, and the wide-ranging infrastructure challenges they present.

Working with Indian partners to address this, the Energy Systems Catapult, Connected Places Catapult and Satellite Applications Catapult delivered a joint programme, Innovating for Clean Air, funded by the Newton-Bhabha partnership. The initiative has supported UK and Indian innovators in Bengaluru to promote best practice innovation and technology exchange, improve the local business ecosystem, and create a sustainable platform for ongoing UK-India government and industry cooperation.

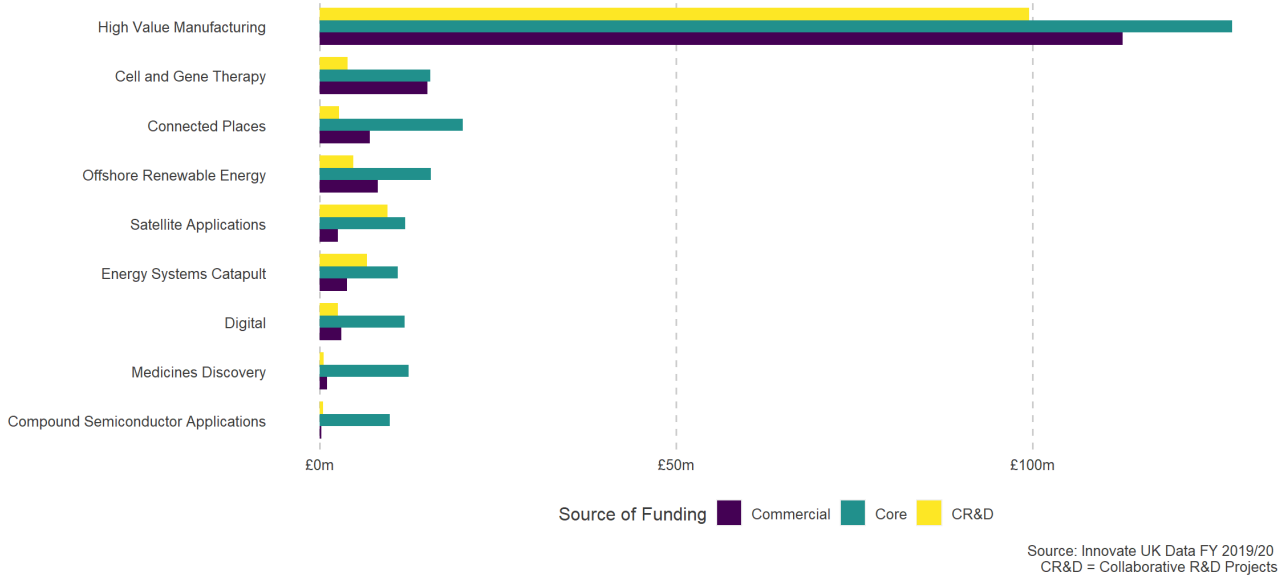
Recommendation 7: UKRI / Innovate UK should review their funding rules to ensure they allow Catapults to collaborate on projects of mutual interest to the network, and evaluate how effectively Catapults are collaborating as part of monitoring and evaluation. UKRI should also review whether Catapults could bid for relevant Research Council funding where appropriate.

Funding Model

The Catapult funding model is based on the Fraunhofer's 'thirds' funding model. This means that one third of their funding should come from core Government grants, one third from CR&D activities, and one third from commercial work. Dr Hauser sees this model fundamental to driving the right activity, and the 2017 EY review recommended retaining the thirds model. However, EY noted the need for flexibility to account for different Catapult maturities, sectors, and funding availability.

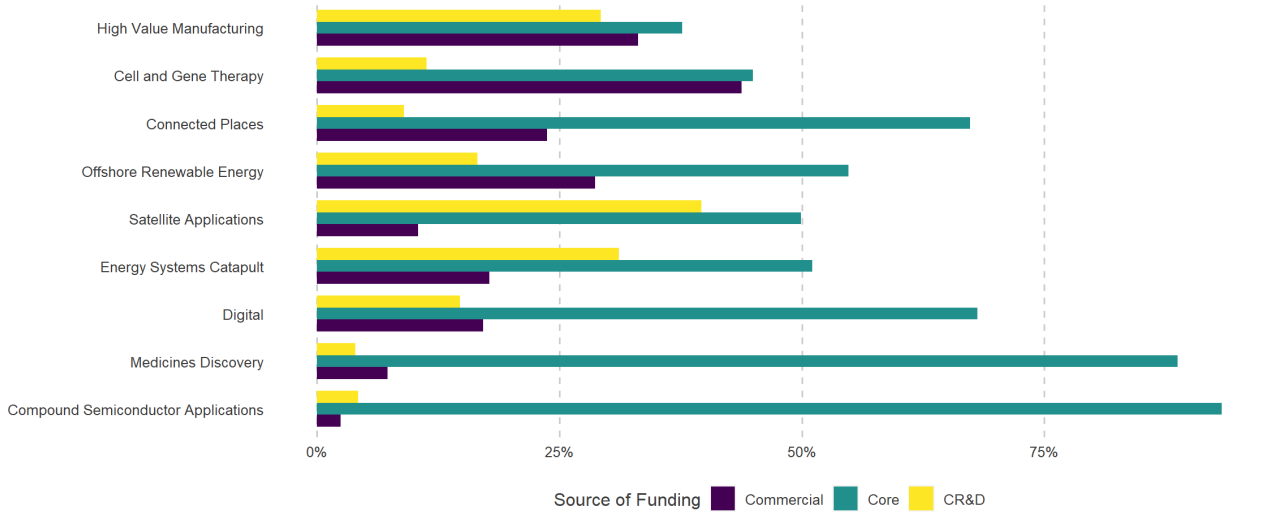
Catapults have varying success in reaching the thirds target. The High Value Manufacturing Catapult, established in 2011, falls closest to the target. The Semiconductor Applications Catapult, formed in 2017, relies most heavily on core funding. The graphs below show the income for each Catapult for the 2019/20 Financial Year, both in absolute terms and with each type of funding as a percentage.

Figure 1 Capital Income for FY 2019/20



Source: Innovate UK Data FY 2019/20
CR&D = Collaborative R&D Projects

Figure 2 Capital Income for FY 2019/20 as a Percentage of Total Income



Source: Innovate UK Data FY 2019/20
CR&D = Collaborative R&D Projects

Universities and SMEs have both told us that thirds target can incentivise the Catapults to compete with them. For universities, this means Catapults bidding for lower TRL work, then sub-contracting the research out to universities. For SMEs, it means Catapults competing for work at the expense of SMEs. However, an over-reliance on any funding stream could undermine the Catapults' core purpose.

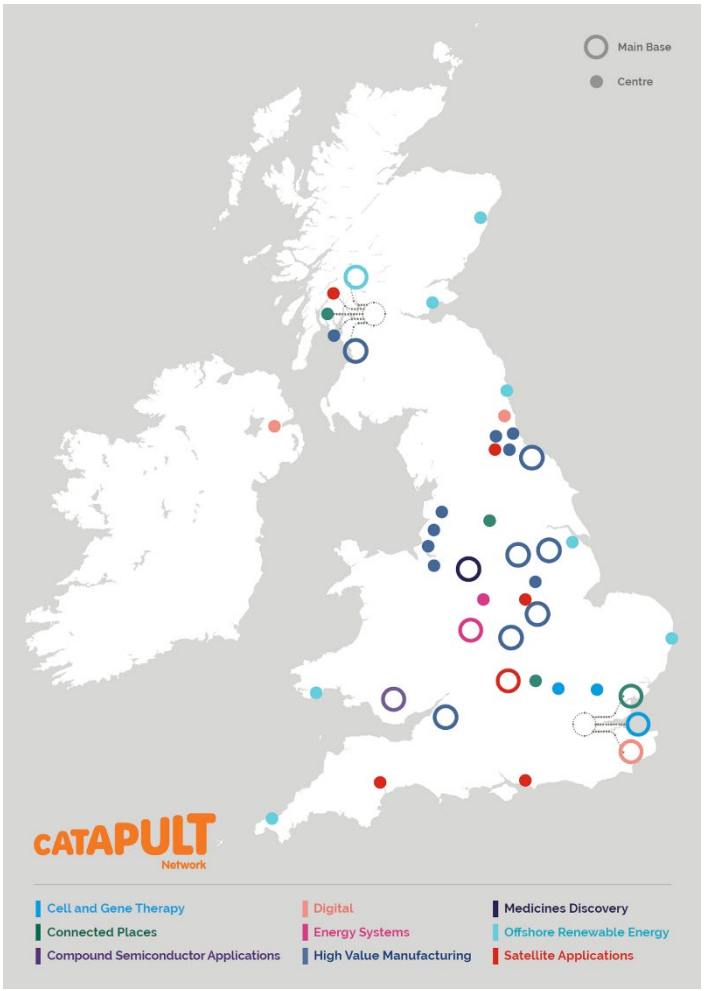
Recommendation 8: The Catapult network should develop a code of practice that provides greater transparency over how they make decisions on competing for commercial work and CR&D. Catapults should have a transparent and robust framework in place to address concerns raised by external stakeholders.

What Next?

Levelling up and local R&D capacity

Catapults are national assets created to support specific UK sectors or technologies. However, by virtue of being located in particular places, they contribute greatly to creating local clusters of innovation activity, by creating jobs and attracting businesses, innovators, foreign investment and global expertise. The nine Catapults have a national presence covering more than 40 locations.

Figure 3 Map showing the locations of Catapult facilities



Dr Hauser recommended that the location of Catapults should consider research excellence, industrial capability and absorptive capacity. In 2014, he noted the positive local economic impact that the Catapults were having, such as spill-over benefits of new industry clusters and supply chains – the Catapults were already engaging locally to develop projects of regional strategic importance.

Stakeholders have told us that they support the expansion of the Catapult network into more regions of the UK, and that Catapults could better understand the demands of regional innovation landscapes by working closely with local leadership, including LEPs and local authorities. The High Value Manufacturing Catapult and the Cell and Gene Therapy Catapult were noted for their roles in developing local clusters of excellence.

The CBI's report, Don't Wait, Innovate, argued in favour of 'Catapult Quarters', innovation clusters based around Catapults.[11] The House of Lords report on Catapults also concluded that the Catapult Network can contribute to the levelling up agenda, whilst continuing to focus on its primary objective to facilitate innovation in promising sectors.

Case Study: Rotherham, South Yorkshire

Rotherham is home to the High Value Manufacturing Catapult's Advanced Manufacturing Research Centre (AMRC) and Nuclear AMRC. Both centres have played an important role in regenerating the area and transforming it into a prosperous innovation hub. The centres' work has created up to 3,500 jobs and attracted over £218m investment from global companies, such as Boeing, Rolls-Royce, and BAE Systems; Boeing has established its only European manufacturing facility in the area. The AMRC Training Centre, linked to the Catapult Network, has equipped over 1,500 apprentices with the skills they need to enter the workforce, and secured placements for them with regional firms.

Catapults are set up to build capability in a specific sector or technology for the UK. They are not designed with local economic growth in mind, so a pivot to levelling up as a core objective would be a significant departure from their core purpose. Given national benefits from Catapults' original purpose, and the risk of undermining that by adding another objective, Catapults should retain their national focus and prioritise their sector or technology domain, with levelling up a secondary but important consideration.

Catapults could nonetheless use their unique positions as conveners to create new innovation clusters across the UK, where this supports their core purpose. They could work with local leaders to find complementarity between their objectives and local need, creating jobs and attract private investment into specific areas. For example, the Connected Places Catapult in Northern Ireland supported the Belfast City Region Deal by working with the councils and industry partners in the area to create a strategic case for funding. The Deal consisted of £350m of public investment and £150m of private investment. As part of the Innovation Strategy, we would want to look at how we might build on Catapults' ability to contribute to local economies. In addition, BEIS is considering how R&D assets and infrastructures can maximise their regional and local economic impact as part of the R&D Places Strategy which will be published later this year.

[11] *Don't Wait, Innovate – Stepping up R&D, from St.Austell to St.Andrews'* (2019), CBI, London

Case Study: Newport, South Wales

Alongside international businesses, universities and policymakers, the Compound Semiconductor Applications Catapult is at the heart of the world's first semiconductor cluster, CS Connected, in Newport, South Wales. The £43m programme integrates research excellence with regional supply chains in advanced semiconductor manufacturing and, by doing so, is supporting Wales to complete the UK supply chain for the production of electric power train components and industrial scale-up programmes that are expected to transform the UK's automotive industry. The Catapult is also creating hands-on, practical learning opportunities for students and graduates to prepare a new workforce for a quick entry into the industry.

Recommendation 9: Catapults should look for opportunities to support local economies, work with local partners and build innovation clusters as part of their overall strategy to support their sector or technology, and report on progress as part of their five yearly reviews. The Innovation Strategy and R&D Places Strategy should consider how to make the most of Catapults' local impact.

Skills

In his 2010 report, Dr Hauser identified that, in many countries, Technology and Innovation Centres support the development of a highly skilled workforce. He pointed to the significant role that established, international institutions play in training and applied engineering skills, either as a specific objective or by creating demand.

Skills development is not a core objective of the Catapults. However, in 2014, Dr Hauser praised the Catapults' work in knowledge transfer between the research base and industry. He highlighted formal training programmes, secondments, and continual professional development; for example, the High Value Manufacturing Catapult had established training centres for specialists and engineers with cross-sector design and manufacturing skills. Dr Hauser suggested that Catapults are uniquely placed to identify and address skills requirements due to their convening role. However, he cautioned that less mature Catapults need to focus on their core technological mission.

During this review, stakeholders have said that Catapults could have a greater focus on skills, particularly as part of their local offer. Stakeholders have pointed to emerging skills gaps and the role Catapults could play in working with industry to relay skills directly into the workforce. They have highlighted that undertaking business R&D in a particular location depends on the availability of a skilled local workforce. Stakeholders value apprenticeship schemes, and have highlighted the need to inspire young people and bring people from diverse backgrounds into Science, Technology, Engineering and Mathematics (STEM). They have suggested that

Catapults could improve or formalise their links to schools and further education centres, for example through studentships, apprenticeships, and improved outreach programmes.

Success stories include the Cell and Gene Therapy Catapult working with Advanced Therapy Treatment Centres to develop skills training from apprenticeships through to doctorates, and the Advanced Manufacturing Research Centre Training Centre providing apprenticeships and continuing professional development courses. Catapults are well placed to identify future skills needs and gaps, and to support businesses to develop a skilled workforce. In doing so, they would support the R&D Roadmap vision to expand delivery of learning and training across UKRI's network of institutes. We will need to establish how this correlates with the College Business Centres pathfinders in 2021 and employer-led Local Skills Improvement Plans, both recently announced in the White Paper: Skills for Jobs: Lifelong Learning for Opportunity and Growth.[12]

Case Study: The Future Manufacturing Workforce

The High Value Manufacturing Catapult, supported by the Gatsby Foundation, led a programme exploring how centres of innovation, like the Catapults, might play a greater role in developing the future manufacturing workforce by learning from international best practice. Engaging with 39 organisations across Ireland, Germany, Switzerland, Singapore and the USA, the study team produced examples, evidence and strategic recommendations to inform policy makers, education providers and centres of innovation as they prepare the manufacturing workforce with the skills that they need to make the most out of the new technologies that the UK is producing.

Case Study: Addressing the Manufacturing Skills Gap

Working with the University of Hertfordshire, the Cell and Gene Therapy Catapult launched a 3-day course designed to specifically address the skills gaps in manufacturing cell and gene therapies as they progress towards production at scale. The course provides participants with the theoretical and practical training required on the aseptic manufacturing of therapies in line with regulatory guidance for good manufacturing practice.

Recommendation 10: Catapults should identify whether they can introduce skills development into the next 5-year review cycle in a way that works for their sector, considers Catapult maturity, and does not compromise core objectives. BEIS will consider whether funding can be made available for skills initiative through future fiscal events.

[12] Skills for jobs: lifelong learning for opportunity and growth. 2021

Equality, Diversity and Inclusion

The business case for diversity is well documented. In addition to the clear moral imperative, studies show a correlation between diverse leadership and innovation[13],[14],[15], with diversity encompassing a broad spectrum including legally protected characteristics, diversity of career path, industry background, education, and socioeconomic background.

The R&D Roadmap identified EDI as a critical aspect of research and innovation culture which requires a multifaceted response to ensure that research and innovation benefits from a diverse range of talent. UKRI's EDI principles[16] promote the value of a diversity of ideas, opinions, knowledge and people in order to support a dynamic, diverse and inclusive innovation landscape; and Innovate UK has identified the need to recognise structures of exclusion within its own organisation and the wider innovation landscape, with an aim to address under-representation when developing and implementing future activities.

The Catapults have started work in this area. In April 2019, the Catapult network issued a concordant with the Knowledge Transfer Network (KTN), which committed to driving change as a responsible employer, research and innovation partner, and purchaser, and to embedding diversity and inclusion at all levels and in all that the Catapults do. The Catapults recognised that utilising their diverse talent pool is a means for driving societal and economic growth throughout the UK.

However, there is limited evidence of this commitment feeding into practice across the network. All Catapults show lack of diversity in their leadership teams, and only one has any publicly available information on EDI – in its 19/20 Annual Report, the Offshore Renewable Energy Catapult committed to an expert-led assessment of its current position to inform a future EDI strategy, as well as outreach measures for those from under-represented groups.

According to UKRI, innovation should be 'for everyone, by everyone'. Catapults needs to do more to uphold this principle, and those principles that the network itself committed to in 2019, including looking at ways to address inequality and under-representation across the innovation community.

Recommendation 11: The Catapult network should reconfirm its commitment to embedding EDI at all levels and in all the Catapults do, including monitoring diversity and publicising their work on EDI. We suggest that the Catapults monitor diversity within their own workforces to ensure equal access to opportunities and support better business outcomes. We also suggest that, as role models to the innovation community, the Catapults publicise their work on EDI and consider opportunities to address inequality in the innovation community.

[13] https://www.bcg.com/en-us/publications/2018/how-diverse-leadership-teams-boost-innovation, https://www.mckinsey.com/featured-insights/diversity-and-inclusion/diversity-wins-how-inclusion-matters
[14] Harvard Business Review. The case for team diversity gets even better. 2014.
[15] BIS. The business case for equality and Diversity. 2013
[16] UKRI: Diversity, Equality and Inclusion

Building on the network

The UK Catapult network currently consists of nine Catapults, with centres spanning over 40 locations. Other countries with more established Technology and Innovation Centres have more. For example, the German Fraunhofer system operates 74 institutions across many sectors.

In 2014, Dr Hauser recommended that the Catapult network continue to grow through a transparent process at a rate of one or two Catapults per year, to a total of around 30 Catapults by 2030. However, he noted that many stakeholders thought the UK should make a long-term funding commitment to the existing Catapults before creating more. He argued that new Catapults should only be created where there is a compelling case and the UK can exploit global market opportunities in areas where it has natural advantages.

Throughout this review, the concept of Catapults has been widely supported by stakeholders. Some stakeholders have asked for the network to be grown in order to seize opportunities in more technologies, referring to the large scale of the German Fraunhofer system as an aspiration. The recent House of Lords report, “Catapults: bridging the gap between research and industry”, recommended that the Catapult network be scaled up. However, some stakeholders have cautioned against rapidly expanding the network because of lack of funding commitment and fear of diluting the brand. We need to ensure the correct balance is stuck between opening new Catapults and ensuring the existing network has the funding it needs to operate effectively.

New Catapults should only be established in sectors or technology domains that provide greatest potential benefit to the UK economy. They should capitalise on existing infrastructure and the existing capabilities of the network. In order to make the most of the Catapult network in the future, the key principles and criteria for establishing new Catapults should be updated to reflect the recommendations in this review and used to make future decisions on how the network could be expanded or strengthened with appropriate funding.

Innovate UK's existing criteria for identifying candidate areas for new Catapults:

- The technology/sector should have a large projected future global market.
- UK industrial capacity should be large enough to anchor significant and high-value parts of the value chain.
- The UK should have strong research capabilities in the area.
- There should be potential for government policy and actions to impact the market
- There should be the potential for spill-over benefits to other parts of the UK economy including from multiple sector effects, regional and technology spill-overs, and impact of productivity.
- The Catapult should address a market failure that is not addressed by any existing centres or facilities.
- The Catapult should have a positive impact on both the sustainability of the UK economy and quality of life for UK citizens.

Where a need is identified for a new Catapult, there could be benefits to incubating pioneer Catapults within established Catapults. For example, pioneer Catapults:

- introduce efficiencies by drawing on existing business systems and resources;
- allow for quick assessment of whether the Catapult model is right for supporting a sector, and can gain support from industry and universities;
- minimise the cost of failure – if Catapults support cutting edge, transformative technology sectors, failure is to be expected in some cases;
- allow organic scale up as they gain investment and partnerships;
- can be spun out when they have grown to the point where they need their own premises and can self-sustain.

Existing centres and capability could also be adapted to become part of the Catapult network, again realising the benefits set out above.

Stakeholders have raised concerns that the Catapult brand lacks visibility and that the network is not as well-known as it could be, both across government and with industry. Greater visibility across government departments could help the Catapults identify more opportunities to support government objectives. Catapults' sectors and technologies can often overlap with the interests of several government departments, presenting opportunities for collaboration.

Case Study: Industrial 5G Testbeds & Trials Programme

In partnership with the Department for Digital, Culture, Media and Sport, the Digital Catapult launched the 5G Testbeds & Trials Programme in 2018 to fuel innovation and provide a test environment for the next generation of digital connectivity. The programme supports projects addressing specific connectivity challenges by creating a platform for the development, demonstration and showcasing of novel 5G use cases in manufacturing and logistics, including how 5G can enable other advanced technologies such as Artificial Intelligence, Virtual & Augmented Reality, and the internet of things. This includes bringing together startups and scaleups, academia, logistics hubs and global companies. The programme highlights market opportunities, stimulates new demand, and helps position the UK as a world leader in the development and deployment of 5G technologies.

Case Study: Transport Technology Research Innovation Grants

Connected Places Catapult delivers the Transport Technology Research Innovation Grants (T-TRIG) programme for the UK's Department for Transport (DfT), shaping innovation challenges and allocating grant funding to accelerate commercialisation projects across transport technology. Organisations are awarded £30k to undertake six-month R&D projects to prove technological concepts. The T-TRIG programme delivered by Connected Places Catapult has already provided £6m of grants to support over 190 transport innovation projects and with great successes, including an electric HGV range extender, a station navigation app for the visually impaired, drone navigation collision avoidance technology and electric cargo delivery bikes.

Recommendation 12: Innovate UK will use its existing criteria, updated to reflect the recommendations in this review, to assess whether new Catapults should be opened if appropriate funding is available. Work to do this should consider priority technologies and sectors and be undertaken as part of the Innovation Strategy, ahead of the 2021 Spending Review. It should ensure we are capitalising on existing infrastructure and the existing capabilities of the network. Innovate UK will continue to provide strategic leadership and horizon scanning for opportunities.

Recommendation 13: BEIS will work with Cabinet Office to provide best practice guidance for Government Departments on contracting and engaging with Catapults. This will include examples of best practice to help government departments understand the benefits of working with Catapults, and help the Catapults to better deliver on government priorities.

Annex

Catapult (start date)	5-year core funding	Income for Financial Year 2019/20, rounded to the closest £100,000				What it does and how it does it
		Core Funding	Commercial	CR&D	Total	
Cell and Gene Therapy (October 12)	£70.6m	£15.5m (44.9%)	£15.1m (43.8%)	£3.9m (11.3%)	£34.5m	Develops the Cell and Gene Therapy Industry in the UK, ensuring life-changing therapies can be used in health services throughout the world. Through its team of experts across sites in London, Stevenage and Braintree, it offers leading-edge capability, technology and innovation to enable companies to take products into clinical trials and provide clinical, process development, manufacturing, regulatory, health economics and market access expertise. The Catapult runs programmes to provide a skilled workforce and to facilitate clinical adoption of these therapies into the NHS.
Connected Places created by merger in April 2019 of Future Cities (June 13) and Transport Systems (August 13)	£100m	£20.1m (67.4%)	£7.1m (23.7%)	£2.7m (8.9%)	£29.9m	Focuses on growing businesses with innovations in mobility services, the built environment and placemaking that drive the net zero transition and boost local prosperity through improved physical, digital and social connectedness. Connected Places Catapult's main offices are in London and Milton Keynes (with additional locations in Leeds and Glasgow), they are active across the country through demonstrators and projects on the ground.

Catapult (start date)	5-year core funding	Income for Financial Year 2019/20, rounded to the closest £100,000				What it does and how it does it
		Core Funding	Commercial	CR&D	Total	
Compound Semiconductor Applications (June 16)	£51.3m	£9.9m (93.3%)	£0.3m (2.5%)	£0.5m (4.2%)	£10.7m	Supports the development of compound semi-conductors and their applications through work to accelerate the use of compound semi-conductor devices within five key areas of application: healthcare; digital economy; energy; transport; and defence and security. Based in Newport, South Wales.
Digital (June 13)	£59.5m	£11.9m (68.1%)	£3.0m (17.1%)	£2.6m (14.8%)	£17.5m	Drives early adoption of advanced digital technologies with a focus on the creative and manufacturing sectors. It identifies, builds and operates physical and digital facilities not currently available elsewhere (e.g. its work for DCMS on 5G test beds). Headquartered in London with local centres in Brighton, Sunderland and Belfast.
Energy Systems (April 15)	£50.1m	£10.4m (50%)	£3.8m (18.3%)	£6.6m (31.7%)	£20.8m	Supports companies and Government to develop products and services to address the new commercial opportunities created by the transformation of UK and global energy systems (covering electricity, heat and combustible gases). Based in Birmingham and Derby.
High Value Manufacturing (a network of another seven centres) (October 11)	£642.9m	£128m (37.6%)	£112.6m (33.1%)	£99.5m (29.3%)	£340.1m	Embraces all forms of manufacture using metals and composites, in addition to process manufacturing technologies and bio-processing. Head office outside of Birmingham with 7 centres and 18 locations throughout the UK.

Catapult (start date)	5-year core funding	Income for Financial Year 2019/20, rounded to the closest £100,000				What it does and how it does it
		Core Funding	Commercial	CR&D	Total	
Medicines Discovery (December 15)	£55.5m	£12.5m (88.8%)	£1.0m (7.0%)	£0.6m (4.2%)	£14.1m	Advances the development of new discovery techniques and technologies through a partnership model focused on SMEs and including service providers, medical charities, national research bodies, academia, clinicians and regulators. Office and laboratories in Alderley Park in Cheshire.
Offshore Renewable Energy (March 13)	£74.0m	£15.6m (54.8%)	£8.2m (28.7%)	£4.7m (16.5%)	£28.5m	Drives the development of commercially viable technologies applicable to offshore wind, wave and tidal power. Headquartered in Glasgow with the National Renewable Energy Centre in Blyth, Northumberland as the main operational facility, and further facilities in Fife, East Anglia, West Cornwall, Pembrokeshire, Aberdeen and Shandong Province, China.
Satellite Applications (March 13)	£68.3m	£12.0m (51%)	£2.6m (11%)	£9.1m (38%)	£23.7m	Supports businesses to realise their potential from space infrastructure and applications. It is based at the science innovation and business campus at Harwell in South Oxfordshire and supported by three Regional Centres of Excellence (North East, South West, and South Coast).

This publication is available from: www.gov.uk/government/publications/catapult-network-review-2021-how-the-uks-catapults-can-strengthen-research-and-development-capacity

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