



Case study on the Digital Catapult, United Kingdom

Contribution to the OECD TIP Digital and Open
Innovation project

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Contribution to the OECD TIP Digital and Open Innovation
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Part I. General overview of Digital Catapult

1. The process of creation

1.1. What are the main factors and background conditions that motivated the creation of the Catapult Centres?

There are several well-known weaknesses in the broad spectrum of UK innovation. The country has capital markets with relatively short-term focus, suffers from low levels of investment in R&D and deficiencies in certain areas of skills. Total investment in R&D in the UK has been static at around 1.8% of GDP since the early 1990s, compared to 2.8% in the US and a figure that is consistently above 2% in Germany. The latest data estimates the figure at 1.7%, below the EU average of 2%.

R&D investment is a key driver of productivity. It directly increases knowledge accumulation and greater R&D improves the quality and/or reduces the cost of production of existing goods and services.

Economists also highlight a distinctive characteristic of R&D, notably that its benefits are not wholly appropriated by R&D investors. It creates spillovers, which provide new sources of knowledge for others, a form of positive externality, contributing to an indirect source of productivity growth across sectors.

While R&D will continue to be important, the changing structure of the UK economy means that economic success will depend on the ability to commercialise and profit from research and ideas, as well as to innovate. In addition to R&D, there are other key drivers of productivity through investments in knowledge based capital, or intangible assets. By capitalising investments in items such as computerised information, innovative property and economic competencies – for example, new business models, training and marketing –, innovation intensity increases to 14% of private sector output, contributing as much as 66% of productivity growth.

It was against this backdrop that the network of Catapults¹ was established, with the headline objective of closing the gap between concept and commercialisation to drive UK economic growth. Catapults remain integral to Innovate UK's five-point plan² to ensure that innovation continues to maximise economic growth in the UK and, broadly speaking, exist to:

- Help UK companies grow by providing them with access to the expertise and equipment they need to develop new technologies and markets
- Reduce the risk of innovation and accelerate the pace of business development
- Create sustainable jobs and growth
- Develop the UK's skills and knowledge base as well as its global competitiveness

¹ <https://catapult.org.uk/>

² Find more information [here](#).

1.2. What are major challenges that the UK faces related to digital transformation, and what is the role of Digital Catapult in addressing them?

Advanced digital technologies offer significant growth opportunities for the UK. They are vital to delivering the vision of a modern industrial economy, most recently set out in the UK Government's Industrial Strategy³.

Prior to the launch of the Digital Catapult, Innovate UK undertook a consultation to identify the key challenges facing the wider adoption of new digital technologies. These challenges included a **lack of ongoing collaboration mechanisms for early stage companies**. These are made worse by a perceived disconnect between users and suppliers within the ICT industry, with fragmentation hampering opportunities for innovation.

Additionally, there were acknowledged high levels of **risk associated with investments** in disruptive and transformative solutions. These were further complicated by ever more complex integration of technologies into systems needed to deliver new applications and services. In parallel, concerns were raised at the non-technology capabilities (economic, legislative and human) that are required to be able to commercialise at scale.

There is also a clear argument that national productivity will be improved by digitalisation of existing industries, and this means larger companies adopting new technologies more rapidly. The barrier to this adoption is a lack of knowledge and understanding of fast moving technologies. This is a key systems failure, with firms failing through lower capability to invest and innovate.

Digital Catapult is building upon the UK's world beating companies, academic excellence and creativity to address the **commercial challenges and weaknesses** that lead to a slowing of potential economic growth. While initially implementing programmes that sought to address the challenges identified by the initial consultation, Digital Catapult used its increasingly important position within the digital ecosystem to identify the largest challenges and focus programmes to address these.

Digital Catapult provides access to facilities for companies to test new products, services, experiences and business models and work collaboratively with early adopters, reducing the risks associated with investments in new and disruptive technologies.

Digital Catapult also plays an essential role in addressing **coordination failures** in new and advanced technologies. A fragmented landscape of advanced digital technologies and a cultural divide between digital start-ups, scale-ups and more traditional sectors, results in a lower level of digital adoption. There exists a knowledge gap of how advanced digital technologies will benefit individual companies and sectors and how they can be applied in individual companies. The Digital Catapult is uniquely positioned to bridge this knowledge gap.

Solving these challenges also requires more than just advice. Digital Catapults programmes of open calls and pit stops provide opportunities for larger businesses to access and connect with leading edge innovators and experts. For their part, these new digital companies can meet and learn from market leaders, find potential new collaborators and clients and tackle specific technical and business challenges raised by the larger partner companies.

³ Find more information [here](#)

1.3. Did the creation of the Catapult Centres involve coordination with other policy areas? What mechanisms facilitate such coordination?

Innovate UK undertook a major consultation exercise in order to effectively implement the creation of the Catapult Network. Innovate UK drew on the Knowledge Transfer Networks and many other bodies to organise **consultation events**. There were a series of large workshops held in each area, and extensive discussions and one-to-one consultations were held with leading business people and academics. There were over 50 separate events and a significant number of individual briefings, with over 3,000 organisations involved.

The conclusions from this consultation were that Catapults would have the potential to add significant value in a number of technology areas but priorities should be based on:

- The potential economic opportunity for the UK,
- The impact a Catapult could have,
- The timing of the investment.

It is important that investment was focused in a small number of centres with the greatest potential for impact, and that the Catapults chosen have critical mass and can provide world-leading commercialisation opportunities.

Based on the consultation, the **criteria for establishing Catapults** were based on the following priorities:

- Is the forecast potential global market that could be accessed through the Catapult worth billions of pounds a year?
- Does the UK have world-leading research capability in the area?
- Does UK business have the ability to exploit the technology and make use of increased investment to capture a significant share of the value chain and embed the activity in the UK?
- Can a proposed Catapult in this area enable the UK to attract and anchor the knowledge-intensive activities of globally mobile companies and secure sustainable wealth creation for the UK?
- Is a proposed Catapult closely aligned with, and essential to achieve, national strategic priorities?

2. Main features of Digital Catapult

2.1. What is the mandate and the specific objectives of Digital Catapult?

The purpose of each Catapult is to deliver long-term benefit to the UK economy and accelerate UK economic growth in its sector or technology domain. A Catapult should achieve this by creating a nexus with the necessary mix of expertise, skills, facilities, equipment and collaborations needed for the UK to shape and pioneer the markets of the future, and drive new and improved products, processes and services from UK businesses into those markets.

In terms of Digital Catapult, our strategic focus is to help to grow the UK economy by accelerating the early adoption of advanced digital technologies. To achieve this, the main objectives of Digital Catapult are:

- Acting as an independent convener and translational interface between the UK's digital sector and the wider UK economy - helping to bridge the cultural divides that slow adoption.
- Working with key industries to shape national strategies around the adoption and innovation of emerging digital technologies (e.g. the Made Smarter Review in Digital Manufacturing)
- Representing the needs of start-ups and scale-ups and informing government and industry to help them design policy interventions / industry initiatives that overcome common barriers, and accelerate growth.
- Providing technical, sector specific and innovation expertise to deliver interventions, facilities and programmes that overcome key barriers to the growth of innovative advanced digital technology companies in the UK and help to drive adoption by industry.
- Aligning with and inputting into the UK Government's Modern Industrial Strategy, focused on the transformational effect of technologies being adopted into targeted industries (Industrial Digitalisation / Made Smarter Review & Creative Industries Sector Deal) and technology areas (AI Review and AI Sector Deal) that will deliver the most impact for the UK economy.
- Working closely with the newly established UK Government Office for AI, aligned with the AI Sector Deal and AI and Data Grand Challenge within the Industrial Strategy to help grow the UK's AI ecosystem and drive the early adoption of the technology by industry.
- Working closely with the UK Government's 5G Testbeds and Trials programme to champion and drive innovative new use cases of the technology by start-ups and scale-ups.
- Working closely with the UK Government's Audiences of the Future challenge to help position the UK as the best place in the world to produce immersive creative content.

2.2. What are specific targets of Digital Catapult?

Specific quantifiable targets include:

- Digital Catapult aims to work, through defined engagement⁴ with initially 550 start-ups or SMEs a year, rising to 750 by 2023 across all of Digital Catapult programmes.
- To generate CR&D and Commercial of £49 million over next 5 years

⁴ A defined engagement is measured as activity most likely to indicate the creation of economic value, taking into account the activity and structure of each project and their open and platform nature. These are defined as use of physical assets, data platforms and exchange hubs, showcasing and contractual

- Leverage £32 million in additional private sector investment over next 5 years
- Manage nearly £140 million, of investment through Digital Catapult programmes

2.3. What type of specific support activities does Digital Catapult provide in order to reach the above mentioned objectives?

Three types of support activities are provided by Digital Catapult:

1. Support for business innovation

- Provide pit-stops and open calls to facilitate commercial opportunities and sign-post potential market information opportunities between large and emerging companies.
- Collaboratively advance innovative technology and product solutions through expert input into national and international R&D projects.
- Leverage role as ‘neutral convenor’ to accelerate development of standards.
- Collaborate with the Open Data Institute (ODI) and other partners to facilitate data exchange and reduce risks. A good example of this is Digital Catapult’s role as a partner in the SynchroniCity project⁵

2. Ideas, facilities and expertise

- Provide accessible infrastructure to enable prototype and scale up testing of new products, and overcome cost barriers in areas such as computation power (Machine Intelligence Garage, see section 8 for more details)
- Create leading edge immersive production and demonstration facilities (Dimension Studio, see section 8 for more details)
- Provide companies across the economy with access to Digital Catapult in-house technical and industry expertise to better understand the potential applications of emerging technologies into new sectors.
- Work closely with industry on large scale demonstrators and test beds to show new ways technologies can be used together (Things Connected Network, see section 7 for more details)

3. Engagement, events and market intelligence

- Collaborate with others in the digital and innovation space to share knowledge and information – bringing together all different parts of the economy and the digital sector to create new synergies and opportunities to work together (Supporting community led events and initiatives in Digital Catapult areas)
- To draw on Digital Catapult expert network and harness internal capability to produce leading market analysis of current and future themes (Writing ecosystem and impact reports, helping to inform national strategies such as the AI Review & Made Smarter, and publishing white papers)

⁵ <https://synchronicity-iot.eu/>

Specific examples of activities that target SMEs are the following:

- **Pit-Stop events** – the model has evolved and is now seen as an effective model for encouraging open innovation and bringing together large corporates, SMEs and academics to solve specific technology challenges. The model has worked well in London (e.g. with corporate sponsors PwC and Thales UK) and in Sunderland and Brighton where the local centres have been working with key employers such as Nissan, Barclays and American Express. The Catapult is seen as having a key role in managing the process, selecting the right attendees and facilitating the events.
- **Augmentor** supports next generation World-class virtual and augmented reality early stage businesses. It is a 10-week programme supporting early stage businesses developing innovative and commercially-focused applications of augmented and virtual reality. The programme gives companies technical and business mentorship, access to state-of-the-art facilities and support to confidently pitch their ideas directly at an exclusive investor showcase. Digital Catapult run other accelerator programmes such as Cyber 101 and Things Connected. The Cyber 101 programme offers intensive one day Bootcamps, Deep Dive sessions and Demo Days that will enable start-up and early stage Cyber Security businesses to better pitch themselves to potential customers and investors. In the case of Low Powered Wide Area Networks (LPWAN), the Things Connected team run innovation programmes for start-ups and small businesses where they can access industry mentors, as well as commercial and academic expertise to help them bring their products to market.
- **Creative XR** commenced in October 2017, and is aimed at boosting immersive content demand and production in the UK; helping companies to create innovative new experiences that are accessible to the public (in this case in the arts and cultural space), exposing innovation across sectors, as well as increasing the UK's international presence as a global leader in immersive technologies and creative innovation. A total of 20 creative teams completed prototypes during the first stage of the programme, and subsequently five of these companies were awarded further funding (provided by Arts Council England, managed by Digital Catapult) to complete their proof-of-concepts, which will be showcased in the network of Immersive Labs.

2.4. To what extent does Digital Catapult collaborate with other actors to provide the above-mentioned support?

It is Digital Catapult's nature to collaborate and this has been demonstrated with the number of research partners exceeding one hundred. Collaboration is essential to the innovative process, and to achieving Digital Catapult's objectives and scale its impact.

Their engagement is through provision of expertise, facilities and access to key networks. Specifically:

- Digital Catapult collaborates with the **wider Catapult Network** in sectors where they have the domain expertise and can benefit from Digital Catapult knowledge and experience in the adoption of relevant technology layers.
- Digital Catapult's connection to the **UK research base** is strategically vital, and has been built to a significant strength. There are two reasons for Digital Catapult to engage with UK university researchers.

First, to provide industrial context back into research and development and increase the impact of research; second, to increase the speed and breadth of commercialisation of research.

- Digital Catapult has a strong relationship with **research councils**, particularly the Engineering and Physical Sciences Research Council (EPSRC) and the Digital Economy theme.
- Digital Catapult has established good relationships with **trade associations and sector bodies**, for example TechUK, the Confederation of British Industry (CBI), the Creative Industries Council and the Association for UK Interactive Entertainment (UKIE).
- Digital Catapult will also continue to work and partner with **other digital and data innovation organisations**, for example the Open Data Institute, Tech City UK, Nesta, the Knowledge Transfer Network and Innovate UK.

2.5. Do the activities of Digital Catapult focus on specific sectors or technologies?

Digital Catapult helps companies develop and demonstrate innovative and successful advanced digital technology business models, products and experiences for the rest of UK industry to emulate. To achieve this, Digital Catapult focuses on 3 key technology programmes:

- **Artificial intelligence, including AI & machine learning**, where Digital Catapult will lead technology adoption in the Industrial Strategy's AI Grand Challenge, rapidly expand their AI programme to accelerate adoption by industry, and grow the UK's machine learning ecosystem. Digital Catapult's artificial intelligence Machine Intelligence Garage programme offers selected cohorts of AI companies access to computation power to develop machine learning enabled products and services, removing a significant barrier to their growth. It brings together major cloud compute providers; specialised hardware providers; access to high performance computing centres paired with deep in-house technical expertise. It helps start-ups with a well-defined business idea for whom access to computation power is a barrier to growth to make appropriate technology choices, and scale up their technical capabilities. It also delivers innovation and acceleration programmes to help foster a closer relationship between innovative AI start-ups and scale-ups and large corporates across the economy to drive the early adoption of these technologies by industry.
- **Future networks, including 5G & low powered wide area networks (LPWAN)**, where Digital Catapult will drive the development of new business models from university labs to commercial reality. Future networks are the advanced connectivity that provide ultra-reliable, ultra-fast and ultra- secure data transfers. They enable the scaling of immersive experiences, cloud based artificial intelligence through 5G, and the collection of Internet of Things sensor data through low power wide area networks (LPWAN). These technologies create a new landscape of innovation that will allow companies to build new business models, experiences, products and services.
- **Immersive, including virtual, augmented, mixed reality & haptics**, where Digital Catapult will make the UK the best place in the world to produce immersive content and applications. A network of Immersive Labs has been built across the

country to help start-ups and scale-ups in immersive creative content to showcase and test new business models, applications, products, experiences and services in virtual, augmented, mixed reality and haptics. Digital Catapult has also built a leading-edge high-definition volumetric capture facility, the “Dimension Studio”, which will enable a completely new range of products and experiences for virtual and augmented reality. This facility uses Microsoft Mixed Reality Capture technology, and is one of only three in the world and the first of its kind outside the US. Through these facilities and testbeds, Digital Catapult will drive innovation and acceleration activities with large corporates and the economy to help them explore new opportunities to use immersive technologies. It will also drive the creation of new immersive creative content and help creative content start-ups and scale-ups to develop new business models, applications, products, services and experiences that will drive the uptake of the technology by industry.

In addition to the three major programmes currently being delivered, Digital Catapult is also undertaking a set of **future scoping and experimentation activities** that may lead to new or enhanced projects in future years. The activities are:

- **Smart Contracts** - exploring application of distributed ledger technologies in the Manufacturing and Creative Industries;
- **Cyber Security** - supporting development of a thriving and dynamic cybersecurity sector in the UK, and maintaining sufficient expert capability to provide advice and guidance on cybersecurity issues that act as a barrier to adoption across the three major programme areas;
- **Disruptive Business Models in Manufacturing** - to explore the opportunity presented by new business models, initially Distributed Autonomous Manufacturing;
- **Experimentation** - to continue to incubate and develop new project and technology areas, based on industry needs and technology horizon scanning;
- **Academic Engagement** - to create collaborations between world leading academic research and industry, and to help increase the impact of research and align it with industry

At present Digital Catapult focuses on two market segments: **Digital Manufacturing and Creative Industries**, and it is exploring opportunities in **Digital Health**. The selection of those sectors was based on the following criteria:

- Is there a global market opportunity?
- Is there UK capacity to compete?
- Is the time now to intervene?
- Are there market failures, which Digital Catapult interventions could impact effectively?

An overview of sectors of focus is presented below:

1. **Manufacturing:** The focus is on accelerating the number of trailblazer companies by:
 - Developing effective leadership in industrial digitalisation for three advanced digital technology areas: Future Networks, Artificial Intelligence and Immersive.

We are driving early adoption and supporting the development of innovative products, applications and services in manufacturing.

- Increasing levels of adoption of advanced digital technologies: Digital Catapult offers innovation and acceleration programmes that facilitate introductions to start-ups and scale-ups and a community of experts, researchers, corporates and investors. We also provide access to leading-edge test beds and demonstration facilities, which would not exist or be affordable without our intervention.
 - Supporting start-ups and scale-ups to leverage innovation assets: Building on Digital Catapult's existing and extensive network of small innovative businesses, their innovation programmes attract and support start-ups and scale-ups to develop solutions for UK manufacturing. Through this support, they accelerate the development and adoption of commercially viable advanced digital technology solutions.
 - Working across the whole of the manufacturing life cycle: Digital Catapult's proven innovation activities help manufacturers to extract maximum value from data throughout every phase of the manufacturing product lifecycle.
 - Working with corporates and smaller innovative companies, academic and research organisations and the investment community, offering short agile engagements which last a few days, through to medium term programmes which last up to three months as well as longer term engagements
2. **Creative industries:** the objective of Digital Catapult is to deliver increased applied research, development and innovation in advanced digital technologies to grow the sector. This will enable new opportunities in business models, contents, and underlying technical services. Focusing on large-scale investment, interventions and collaboration are essential in new areas like artificial intelligence and immersive systems to achieve substantial impact such as making the UK the best place in the world to create virtual, augmented and mixed reality content. Exploring emerging digital technologies such as blockchain, smart contracts, and future networks will also open up possible new markets for the sector.

2.6. What is the annual budget allocated to Digital Catapult? What are the sources of funding?

The annual budget of Digital Catapult is of around £20 million.

The establishment and operation the network of Catapults with world-leading technical capabilities is supported through substantial investment – from both public and private sector. To demonstrate their importance, Catapults also need to create a critical mass of activity surrounding them, which will anchor the activities of globally mobile companies in the UK.

The Catapults generate funding from a mix of competitively earned commercial funding and core grant investment from Innovate UK. The funding model varies through the 5-year delivery plans of each Catapult, but can be expressed in simplified terms as following the one-third, one-third, one-third model.

Under this model, Catapults generate their funding broadly equally from three sources:

- business-funded R&D contracts, won competitively

- collaborative applied R&D projects, funded jointly by the public and private sectors, also won competitively
- core public funding for long-term investment in infrastructure, expertise and skills development

3. Digital Catapult in practice

3.1. What is the governance model of the centre? What type of organisational structure does it have?

Digital Catapult is a company limited by guarantee (CLG), a **separate legal entity** from Innovate UK. It has its own Board with an Executive Management team responsible for the day-to-day management of each Catapult.

Digital Catapult's operating model underpins the successful execution of the strategy and delivery of the impact goals. This operating model consists of three parts, described below: organisational structure, place and methodology. From an organisational hierarchy perspective, Digital Catapult is **organised functionally**, ensuring clear ownership and responsibility for the activities and outputs.

To drive delivery of the programmes, Digital Catapult has established **multi-functional matrix teams** to focus on each programme area, encompassing technologists, business specialists, project and product managers, policy, research and engagement and innovation experts, all supported by centralised Finance, Sales and Bidding, IT & Engineering, HR and Marketing & Events functions.

This approach delivers benefits in programme focus combined with economies of scale for centralised services. In building and maintaining the team, Digital Catapult aims to achieve a good balance of inclusivity and diversity.

The organisation includes over 40 technologists, software engineers and architects, as well as 19 PhDs, and represents a very strong senior team with a structure that will enable scaling through bringing in more junior roles, from apprentices to post-docs. The engagement with academia and the innovation ecosystem serves a dual purpose in providing access to a pipeline of talent. The breadth of technologies represented with both academic and commercial expertise is unique across the innovation ecosystem.

Investment has already been made for 2018-19 in the Business Development, and Policy, Research, Engagement and Economics teams to enhance impact monitoring, business research and engagement, and industrial sector tracking and monitoring to ensure that outcome tracking and data provision for impact monitoring can be supported.

The organisation is projected to grow by approximately 43 - from 129 FTE to 172 FTE - over the course of the five-year period, based primarily on investing in increased technical expertise, business development and programme delivery capacity.

3.2. Regarding the geographical location of centres: what are the criteria for the establishment of centres across the territory?

The current location of centres is as follows:

- The main centre is located in central London and there are local centres in North East and Tees Valley, Brighton and Northern Ireland
- There is an Immersive Lab in London, and regional Immersive Labs were recently opened in Brighton, Belfast and Gateshead (under the wider initiative of the NETV centre). Further to this we have an immersive network incorporating Partners' facilities nationwide.
- The UK's first Reality Capture studio has also recently been opened in London.
- A 5G testbed opened in Brighton

Digital Catapult's goal is to grow the economy nationally and this means taking action not just in London, but also in the devolved nations and regions of the UK. In order to deliver this, Digital Catapult has created an initial phase of regional centres in Brighton, North East and Tees Valley and Northern Ireland.

The Brighton centre is partnered with the local LEP and the University of Brighton, the Sunderland Centre is a partnership with the North East and Tees Valley LEP and the Belfast centre is a partnership with the devolved administration.

All the regional activity, including centres, Strategic Partnerships and ad hoc engagements are collaborations with local stakeholders and are representative of local and national agendas. Each centre or project has the autonomy to develop unique and locally driven interventions as well as those within the overall Digital Catapult strategy. In all of the regional initiatives and programmes, there are strengths derived from the presence of particular clusters of companies and academic expertise.

For example, Belfast has extensive expertise in immersive, led by the growing creative industries presence, namely screen tourism and predictive analytics cluster, the North East has Europe's first virtual reality industry-led centre of expertise, while Brighton is a creative cluster. However, there are some regional specialisms and opportunities, which means that some of the centres will choose to focus on different sectors. Digital Catapult continues to develop regional relationships and programmes, whilst ensuring all programmes, regardless of location, are nationally accessible.

3.3. What are the mechanisms in place to ensure that the activities of Digital Catapult are in line with its general objectives?

Digital Catapult's framework for delivery has been developed and honed over the first five years of operation. The corporate governance and accountability arrangements for Digital Catapult draw on good practice in the public and private sectors and reflect its position both as a public funded research organisation and as a revenue-earning organisation. The governance arrangements centre on a number of key roles, most specifically:

- Chair of the Digital Catapult Board;
- Digital Catapult Chief Executive;
- Innovate UK Observer.

In discharging these roles, those concerned are supported by a number of boards and committees, each of which has a distinct purpose:

- Digital Catapult Board;
- Digital Catapult Board Sub-Committees;
- Digital Catapult Management Team.

The work of individuals in these key roles and of all Digital Catapult staff is governed by statute and by a series of key governance documents, which include the Innovate UK Grant Funding Agreement, a Deed relating to Catapult Membership and the Digital Catapult Memorandum and Articles of Association.

Digital Catapult will also conduct its business on the basis of its:

- Five Year Plan;
- Delivery Plan (annual);
- Terms of Business Agreements with third parties.

Important business decisions, which would affect the strategic direction of Digital Catapult or would have significant financial implications, will be set out in a business case submitted to the Board for appropriate consultation and approval. As a private company limited by guarantee, Digital Catapult is required to prepare and publish annual accounts following audit by a recognised and certified firm of auditors. As a research organisation in receipt of public funds, Digital Catapult is required to conduct any economic activity in a way that does not undermine its status as a research organisation.

For this reason, Digital Catapult executes all economic activity through its wholly-owned subsidiary Digital Catapult Services Limited, a private limited company. The Board provides the vision, experience, advice and leadership to guide the Management Team and ensure Digital Catapult delivers against its commitments.

3.4. What challenges have been faced during the process of design and/or implementation of Digital Catapult and how are these being addressed?

Impact of Digital Catapult is dependent upon talent that is able to develop and provide access to the required expertise and capability, and as such presents a crucial element of success. Identifying and attracting the required technical expertise can be a challenge in what is a highly competitive sector and location. Digital Catapult competes with the large corporates who seek to attract the same talent, and with start-up businesses that offer a compelling proposition for leading experts engaged commercial and near to market technology research.

3.5. Are other UK policy initiatives in line with the objectives of Digital Catapult? In what ways do they reinforce each other?

Digital Catapult will deliver on the aims of the Industrial Strategy through technology programmes in artificial intelligence, immersive and future networks. These “advanced digital technologies” will be applied in the creative and manufacturing sectors offering the greatest potential for long-term UK impact. Digital Catapult’s strategy is a catalyst, driving increased job creation, greater private investment and increasing UK GVA over the next 5 years and beyond

The importance of place features prominently in the Industrial Strategy, and it is recognised that the only way to scale impact and ensure the whole of the UK will benefit from the early adoption of advanced digital technologies is by working with regional partners across the UK.

Digital Catapult has already started this by establishing local centres in Northern Ireland, North East & Tees Valley and the south coast. They will seek to enhance and deepen their collaboration. Local authorities, LEPs and universities offer significant opportunities for growth in the programmes. Digital Catapult will contribute to local industrial and economic strategies, and develop exciting new regional partnerships, starting with the Greater Manchester Combined Authority.

4. International dimension

4.1. Does Digital Catapult have an international dimension?

Digital Catapult has rapidly built a strong international standing, with particular success in securing EU funding, joining and bringing small UK companies into European-wide R&D consortia and building a reputation for reliable delivery. Through these partnerships, Digital Catapult has worked with over 40 European companies and 14 European universities, secured EUR 4.7 million of funding and cascaded EUR 1 million to UK businesses.

As the UK leaves the European Union, Digital Catapult will also look to address more global opportunities. Based on a reputation for success, Digital Catapult has hosted over 30 international delegations. Over the next five years, Digital Catapult will exploit this reputation, and its knowledge and relationship with the UK tech start-up and scale-up ecosystem to support global export and inward investment opportunities that arise in the three programme areas of AI, future networks and immersive.

Digital Catapult will also be involved in bilateral and multilateral missions and projects outside of the EU, running open calls, pitching competitions and open innovation activities with large British companies expanding overseas, building strong relationships in countries with a clear opportunity for the UK's most exciting emerging technology start-ups and scale-ups, working closely with the Government, industry and the innovation ecosystem globally to help showcase the UK's strengths at key international events and conferences. This will be with the goal of driving the UK's global leadership in advanced digital technologies, attracting investment into the UK and helping exciting scale-ups to explore new international markets.

Already, Digital Catapult has secured the UK as the only country outside of the USA to host a volumetric capture studio based on Microsoft technology, representing an inward investment of USD 25 million in software development. Specific targets for inward investment and export include the EU 27 and countries with established digital innovation ecosystems such as US, Canada, India, Brazil, South Korea, Japan and Singapore. To do this, Digital Catapult will work with partner organisations, such as the Foreign and Commonwealth Office (FCO), the Department of International Trade (DIT), the UK Research and Innovation (UKRI) and Innovate UK.

Digital Catapult will leverage the strength of capability that their core programmes are growing to attract further inward investment into those new developing market areas. They

will for example seek to attract further immersive production capability into the UK from the US and Asia. Equally as they grow UK capability in IoT, they will seek to help increase export opportunities into such countries as Brazil and India for the developers of new services and applications on future networks in IoT.

4.2. In what ways did experiences from other countries inform the development of the Digital Catapult (or Catapult Centres in general)?

The report prepared in March 2010, by the entrepreneur Hermann Hauser, *The Current and Future Role of Technology & Innovation Centres in the UK*⁶, made a robust case for long-term UK investment in such centres and identified best practice from around the world. The justification for such investment was reinforced by James Dyson in his report *Ingenious Britain*⁷.

The Hauser Report explored the role of Technology and Innovation Centres (TICs) in 12 countries: Germany, South Korea, Sweden, France, China, Denmark, USA, Japan, Singapore, Israel, Belgium and the Netherlands. The German model of Fraunhofer Institutes is often referred to as one of the most successful examples of a national network of TICs. A UK parliamentary committee concluded that the Catapults had many of the characteristics summarised in the Hauser Report.

5. Impact

5.1. Has Digital Catapult's impact already been evaluated? If so, what have been the outcomes? If not, how and when are impacts planned to be evaluated?

Digital Catapult is evaluated by an independent consultancy appointed by Innovate UK. An initial evaluation was concluded in June 2017, with further evaluation reports being prepared in 2018 and 2020. While recognising the challenges inherent in measuring short-term impact within emerging and disruptive technologies, the headline impacts show strong progress so far:

- **Stronger employment growth:** Detailed statistical analysis undertaken as part of the evaluation found employment growth among Digital Catapult businesses to be 16% on average, around 3 times higher than for a similar group from the wider economy.
- **Higher rates of business survival:** The same analysis found Digital Catapult businesses were less likely to fail, with 6-11% lower rates of business deaths compared to a similar group of companies.
- **Focusing on a smaller core set of companies yields greater impacts:** A number of key findings from the independent evaluation validate the strategic decision to target greater engagement on a smaller number of businesses. The findings show

⁶<https://catapult.org.uk/wp-content/uploads/2016/04/Hauser-Report-of-Technology-and-Innovation-Centres-in-the-UK-2010.pdf>

⁷<https://catapult.org.uk/wp-content/uploads/2016/04/Ingenious-Britain-James-Dyson-Report-2010.pdf.pdf>

businesses are focusing on developing products and business models rather than a race for rapid turnover growth:

- The rate of innovation among highly engaged businesses was over 3 times that of low engagement. 71% of these businesses reported bringing new products and services to market quicker with the support of the Digital Catapult than would otherwise have occurred.
- 69% of highly engaged businesses achieved their aims of establishing a new collaboration, with a further 15% expecting to do so in the near future. This compares to 18% for low engagements.
- 26% of highly engaged businesses increased R&D investment, with a similar share expecting to in the near future. This compares to 5% among low engagements.
- 18% of highly engaged businesses reported an increase in external funding, with a further 38% expecting investments in the near future.
- 59% of highly engaged businesses reported improved understanding of market opportunities, compared to 31% among low engagements.

These findings highlight that Digital Catapult's support will increase businesses capability to innovate, to catalyse the launch of new products and services and to help businesses scale to achieve greater presence in the market.

In addition, Digital Catapult is committed to implementing the highest standards for monitoring and evaluation. Their approach integrates the logic model in a systematic and robust manner. As detailed in the Digital Catapult's 5-year delivery plan, they undertake a 3-stage process to monitoring and evaluation built around the logic model approach:

- Collection of activity and output data on Digital Catapult engagements with SMEs, academics and other organisations;
- Collection of primary data on internal capabilities for firms and periodic reporting of changes in key business metrics like turnover and employment to measure progress towards intermediate and longer term outcomes;
- Modelling projected impact utilising activity and primary data collected in stages 1 and 2.

Part II. Insights on selected projects

6. Things Connected

Things Connected is an initiative by Digital Catapult to support UK businesses using low-power wide area network (LPWAN) technologies. It provides access to a free-to-use network for the experimenting and prototyping of new IoT products and services that can benefit from the unique features of LoRaWAN and SigFox (two market leading LPWAN technologies). It will foster the emergence of a strong UK based LPWAN ecosystem to ensure the UK is open and ready to innovate with the Internet of Things (IoT).

It also runs innovation programmes for start-ups and small businesses where they can access industry mentors, as well as commercial and academic expertise to help them bring their products to market.

6.1. What are the specific objectives of the project?

The main goals of the Things Connected initiative are:

- Provide access to advanced technology testbeds (LPWAN) and an innovation support programme for UK SMEs around challenges of problem owners
- Help UK companies both small and large to seize the opportunity
- Stimulate the demand for LPWAN based innovation to solve digitisation problems of UK industry (industry across various sectors)
- Stimulate the emergence of the right supply side solutions to respond to supply side challenges from UK SMEs

6.2. What is the (annual) budget allocated to the project? What are the sources of funding for the project?

- Initial London based testbed was built upon a £25,000 grant
- Co-investment from BT (a UK provider of business broadband and phone services) to match fund to double network infrastructure
- Established initial proof-point and delivered first innovation programme from core funding, which also included the building of website and experimentation portal for the network
- Unlocked further £750,000 for 3 regional extensions of the network, which allowed us to select partnerships for the delivery of a 1 year long innovation support programme around challenges of challenge owner in the 3 regions on top of these networks

6.3. What are the main factors that motivated the design and implementation of the project? What is the main challenge with regards to the digital transformation the project aims to address?

The main factors that motivated the project is a market failure of UK operators to deploy LPWAN networks in the UK – leaving UK companies both solution providers and adopters lose out on a globally emerging opportunity.

Digital Catapult’s intervention helped to address the market failure by providing a stepping stone for UK business to explore the technology and enter the market. Depending on the sector, the technology can enable a diverse set of digital transformations by providing operational insights to improve ongoing business processes and significantly increase customer experiences. Examples include the remote monitoring of geographically dispersed assets for a large variety of manufacturing businesses or new smart services for city councils and their citizens.

6.4. What challenges have been faced during the design and/or implementation of the project and how have they been addressed?

Various challenges have been faced:

- Roll out of network infrastructure – solved by establishing partnerships with organisations providing deployment sites;
- Lack of ecosystem maturity – created LPWAN community with regular get together to build coherence, share best practices and experiences;
- Perceived technology bias – the initial network was only LoRaWAN specific, and other vendors/emerging operators complained. Digital Catapult were able to partner with these operators and incorporate more technologies into the programme to enforce neutrality.

7. Dimension Studio

7.1. What are the specific objectives of the project? What are the main characteristics of the project?

Dimension Studio is a volumetric capture studio located in Wimbledon, London, offering unique access to Microsoft’s Mixed Reality Capture technology (also known as holographic capture, or H-Cap). The studio is being run by a consortium of companies (Hammerhead, TimeSlice, Digital Catapult). It is the first studio of its kind in the UK and potentially the first commercial studio Worldwide to offer access to H-Cap technology.

Volumetric capture is considered to be the next step for the creation of compelling, photorealistic performances that will drive the next generation of immersive experiences and products. Digital Catapult’s Dimension Studio aims to ensure that the UK has first access to this technology and look after the interests of UK SMEs and enable further academic R&D.

The expected impact is the boost of immersive content creation in the UK, firstly for UK companies but also for attracting overseas productions to the UK.

7.2. What is the main challenge with regards to the digital transformation the project aims to address?

The key barriers faced by firms that the early stages of the programme aim to address are:

- Limited access to state of the art facilities and expertise – which are required for research, experimentation, demonstration and product development, in particular for small, innovative tech start-ups in the UK who are competing with larger, global organisations;
- A fragmented ecosystem - that contains the relevant skill sets but requires convening to foster collaboration, build a common language and act as a focal point for investment and growth;
- Poor awareness of the potential and opportunity – first, among investors, commissioners and established businesses of all sizes who may not understand the power of the technology, thereby limiting market entry; and second, among those that are entering, which limits their access to markets, customers and investors.

Dimension offers unique production capabilities, and will be instrumental in capturing and creating the next generation of realistic virtual humans and virtual worlds for Augmented Reality, Mixed Reality, Virtual Reality, and 2D touch screens. The opportunities for the entertainment, creative services, and digital manufacturing industries – to name just a few will be seismic. Now, they will be able to capture 3D video content at a greater level of realism and authenticity.

Dimension has two specialist capture rigs, each with over a hundred cameras for state of the art processing, giving unparalleled quality and detail. With one rig for mixed reality video capture and the other rig for creating 360-degree static images, there is no other facility offering such advanced capture globally.

Thus, it is an enabling technology to grow the creation of high-end quality virtual reality content. This will encourage wider adoption and give UK a unique position to export greater content.

7.3. What challenges have been faced during the design and/or implementation of the project (if any) and how have they been addressed?

Two main challenges are faced:

- The technology has been within R&D at Microsoft for 8 years, so the challenge was to progress to commercial application. The project de-risked the technology through collaboration with partners and with aligned incentives. The first step was for Microsoft to license the technology. Digital Catapult is providing the funds for purchase of equipment. Digital Catapult will also be a board member and look after the interests of SMEs and academics. Digital Catapult will also lead on public relations and marketing of the studio. Hammerhead & Time-Slice will manage the operations of the studio and hold the exclusive licence of Microsoft's technology.
- Identifying a site for the studio was a challenge. A key requirement was to be in London and have sufficient space. Fortunately, existing studio space became available and so was able to locate within an existing cluster.

8. Machine Intelligence Garage

Machine Intelligence Garage is a programme that helps businesses access the computation power and expertise they need to develop and build machine learning and artificial intelligence solutions.

Machine Intelligence Garage is designed to help start-ups with a well-defined business idea and technical capability for whom access to computation power is a barrier to growth. Successful applicants will get access to best-in-class cloud compute, hosted hardware or UK HPC from project partners and collaborators.

Garages hold a special place in the history of tech. They are the beginning of great things; a place where game-changing innovations are born and incubated. Machine Intelligence Garage will host workshops and experimentation-days to help companies of all sizes get to grips with systems for machine intelligence. The programme is independent and provider-agnostic.

8.1. What are the specific objectives of the project?

Machine Intelligence Garage helps early stage UK AI companies grow by providing access to computation power and expertise alongside a programme of activities that focuses around experimentation with computation power available for businesses of all sizes

8.2. What are the main characteristics of the project?

For the access to **computation power** and expertise, the programme is targeting **early stage** AI companies. Digital Catapult are looking for start-ups that meet the following criteria:

- Early stage firms developing AI-enabled product or service
- Strong business case
- Strong technical implementation plan
- Data for project is ready to be used
- Immediate need to access computation power
- The firm has assessed the ethical implications of its solutions

Start-ups interested in accessing computation power are invited to apply to the Open Call on the project website, www.migarage.ai.

Machine Intelligence Garage is also looking to support business of **all sizes** to experiment and learn more about different computation resources, especially emerging hardware and software that might not otherwise be easily accessible to companies.

8.3. What is the (annual) budget allocated to the project?

The budget is currently partly funded by the European Regional Development Fund and Digital Catapult core grant for £360,000 this financial year. Machine Intelligence Garage is part funded by Innovate UK and the European Regional Development Fund.

8.4. What are the main factors that motivated the implementation of the project?

In summer 2017, Digital Catapult has conducted an extensive research in an attempt to better understand the different needs UK companies developing AI solutions have when it comes to computation resources and access to these resources. The study showed that over 60% of early stage AI companies consider themselves compute constrained. Companies of all sizes developing AI products or services would like to access more activities directed at improving their knowledge and understanding of both existing and emerging compute resources. More information about the findings of this research can be found in the [Machines for Machine Intelligence Report](#).

8.5. What are the main factors that motivated the design and implementation of the project? What is the main challenge the project aims to address?

Machine Intelligence Garage is a programme that helps businesses access the computation power and expertise they need to develop and build machine learning and artificial intelligence solutions.

In order to deliver against this goal, the following key barriers faced by firms need to be addressed:

- Lack of access to the most appropriate compute power, at an affordable rate – particularly for small, innovative tech start-ups that do not have the same level of funding as the established players;
- Insufficient knowledge or understanding of existing and emerging computation resources
- An immature marketplace – so that challenge owners, predominantly large organisations, with relevant data sets cannot easily access start-ups that can help them, and vice versa;
- Limited understanding of the value of the data held or how to unleash it – both for established businesses who may not understand the power in the data they hold or could gather, and for the tech start-ups who need access to markets and customers.

Machine Intelligence Garage is designed to help start-ups with a well-defined business idea and technical capability for whom access to computation power is a barrier to growth. Successful applicants will get access to best-in-class cloud compute, hosted hardware or UK HPC from project partners and collaborators.

8.6. What challenges have been faced during the design and/or implementation of the project and how have they been addressed?

Programme has been live since January 2018. Challenges faced so far relate to finding the optimal process for engaging companies with the programme activities, i.e. how frequently should the project team run Open Calls, what criteria for selection should they use, how should they on-board companies.

**8.7. What have been the project's impacts on supporting the digital transformation?
What are its socio-economic effects?**

The programme was launched in January 2018 and will run for a period of 3 years. So far, the Machine Intelligence Garage has supported 13 start-ups with access to cloud compute vouchers of USD 100,000 each, 2 start-up with access to NVIDIA DGX-1 for a period of 4 weeks and an additional 4 start-ups with 16 hours of Machine Learning expert support from Newcastle University.