



Select Committee on Science and Technology

Corrected oral evidence: The contribution of the innovation Catapults to delivering the R&D Roadmap

Tuesday 8 December 2020

10.15 am

[Watch the meeting](#)

Members present: Lord Patel (The Chair); Lord Borwick; Lord Browne of Ladyton; Baroness Hilton of Eggardon; Lord Hollick; Lord Kakkar; Lord Mair; Baroness Manningham-Buller; Viscount Ridley; Baroness Rock; Baroness Sheehan; Baroness Walmsley; Baroness Young of Old Scone.

Evidence Session No. 1

Heard in Public

Questions 1 - 11

Witnesses

Professor Dame Ottoline Leyser, Chief Executive, UK Research and Innovation;
Dr Ian Campbell, Former Executive Chair, Innovate UK.

USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Examination of witnesses

Professor Dame Ottoline Leyser and Dr Ian Campbell.

Q1 **The Chair:** Good morning, everybody, and a particularly warm welcome to Dame Ottoline and Dr Ian Campbell, our two witnesses today. Thank you very much for coming today to help us with this inquiry on Catapults. Can I make it clear that this is not a review of Catapults by us? We just want to do a very brief inquiry to see how they can be expected to contribute in the future and whether they are set up to do so. We have quite a few questions for you this morning, so I will start straightaway.

Dame Ottoline, very briefly, what is the purpose of the Catapults? More importantly, what are they expected to contribute to the developing Roadmap and beyond that? How are they funded? In particular, what amount of public funding did they receive, for instance, last year? Do they all receive the same amount of funding?

Professor Dame Ottoline Leyser: The Catapults are a really important and unique part of the whole research and innovation system. I am a very strong advocate for thinking very hard about the connectivity in the system. We all know that in the UK we have a really fantastic, strong, basic discovery research base; we are leading on all kinds of international indicators in that sphere. We also have a lot of really exciting, innovative companies. We also know that the relationship between those parts of our research and innovation system could do with filling in, strengthening and diversifying, to make sure that the connections across that system are really strong. Catapults play a really important role in that connection. They sit in a part of the system that absolutely fits between those two domains, if one wants to think about it in that way.

They have multiple roles. There are almost fairly straightforward roles in de-risking the middle TRLs in the development and adoption of new technologies. They also play a really important role in connecting things up, in sitting between those different areas of the research base and in bringing people together from across the system to share ideas, expertise and skills.

Those roles are key. There is a very specific de-risking role in addressing a clear industry pull in the development of new technologies and approaches, while bringing together all the different parts of the landscape—almost physically, in particular places—to exchange ideas, network and explore more broadly the opportunities that there are to drive innovation and business investment in our incredibly high-quality research and innovation system.

Are they currently set up to do that? We have some really fantastic and strong Catapults. We are moving in a really good way to capture the strengths of that network and to evolve it in a way that builds on those strengths—to think harder, for example, about the network as a network, to share good practice across the network, and to exchange ideas about the best ways of working.

We need not to be too dogmatic about what the right sort of Catapult looks like. It is more about delivering those key functions into the system and delivering them in the most effective way for the particular technology or industry at hand. There is no one way to do it; one needs to be sensitive to the needs of particular sectors as we develop that, and we need the flexibility to be able to operate in that way.

In terms of investment, the centres currently receive a core budget from Innovate UK on a five-year basis. The total for that core budget for 2019-20 across the whole Catapult network was £236,245,933. Then, of course, they attract significant commercial investment and have a collaborative R&D element funded through a variety of mechanisms. Overall, there was £520 million in that system last year.

Is it evenly distributed across the Catapults? No, it is not. They are at different stages in development. They also have very different histories. The High Value Manufacturing Catapult has the largest budget, which is close to £130 million, but that is multiple centres distributed across the country and was inherited into the system from pre-existing activity. The new ones that have been started since tend to have budgets in the £10 million to £15 million category and are more evenly distributed in that core budget. They then attract different levels of investment from other sources, depending very much on the sector that they are in and where they are in their evolution.

Ultimately, the goal of a Catapult is to make itself redundant. If you are de-risking some key part of the system, once that new technology, approach or way of thinking has been broadly adopted by business, the role for that Catapult should disappear. Obviously things change, so an alternative way of thinking about it would be to evolve Catapults going forward as the technology landscape and the needs of that business sector change.

The Catapults have an absolutely core role. We need to think about that role in a nuanced and sensitive way, in the multiple things that they deliver into the system, and be happy to tune the system according to the needs of different sectors, rather than becoming too locked into a particular mode of thinking about them and what they can and cannot do.

The Chair: I should have said to Committee members that, if they have any interests to declare that are relevant to this inquiry, they should please do so before they ask their question. I should have declared mine: I am on the advisory board of Warwick Manufacturing Group, which is associated with one of the Catapults. Dr Campbell, do you have any brief comments at all?

Dr Ian Campbell: Just to expand on some of Dame Ottoline's observations, first of all, the Catapults were originated in different ways. The Hermann Hauser review in 2011 kicked off the concept of Catapults. Two of the Catapults have come from regional development agency legacy enterprises: the High Value Manufacturing Catapult and the Offshore Renewable Energy Catapult. The first true Catapult to be established was the Cell and Gene Therapy Catapult, followed by the Satellite Applications Catapult.

Catapults fall into three categories. The systems Catapults are more like consultancies and collate companies together to change procurement or regulation, as well as to drive innovation. We have, at the other end, things like the High Value Manufacturing Catapult, which are asset-intensive and allow small, medium and large businesses to access assets that they otherwise would not be able to get hold of, in order to develop their products and services further. You then have a middle swell that has a combination of assets, resources and capabilities to help drive innovative technologies into the market. We need to think of them as a blended model and not as uniform entity.

Q2 Lord Mair: I start by declaring my interest: I am a professor of engineering at the University of Cambridge and head of the Centre for Smart Infrastructure and Construction, which interacts with a number of Catapults.

Dr Campbell, the Government aim to increase total R&D investment to 2.4% of GDP by 2027, around two-thirds of which will be from industry. What is the role of Innovate UK in enabling the Catapults to deliver greater private sector investment in R&D?

Dr Ian Campbell: There are two answers to that question. The first is that we have to allow Innovate UK to have the capacity to fund high-risk innovation. Where a company is looking to move into a new area or a new product or to develop new technologies, sometimes that risk appetite is too high for the company to take on its own. Therefore, Innovate UK has both to provide companies with financial support where it is needed and to align that with the infrastructure and capabilities that the Catapults have, to deliver meaningful services that allow businesses to take that leap and invest more money into private R&D.

The key factor for us is the additionality. Are we allowing businesses to leap ahead and leapfrog technologies and to become truly world-leading with products and services? Innovate UK needs a budget and a mandate to be able to do that.

Secondly, as far as the Catapults are concerned, we need to look at how they are funded to ensure that we get the right model. Currently, Catapults are funded with a third core funding and a third from collaborative research and development funding, which comes from a combination of Innovate UK funding and other potential grant sources such as European Union funding. Thirdly, we need to make them commercially attractive so that businesses will pay to access the services that the Catapults can derive.

We need to provide that infrastructure across the country. A number of the Catapults have a headquarters in one place and remote sites throughout the country. If you look at the map, there are Satellite Applications Catapult sites in Belfast and Wales, there are Offshore Renewable Energy Catapult sites down in the south-west, and the main High Value Manufacturing Catapult sites are spread through the spine of the country. They are geographically well placed to serve businesses across the UK.

We also need to be better at connecting them together to ensure that businesses can get in through one front door and access services across all the Catapults. We are living in a world where, increasingly, cross-disciplinary research and development is more important than a single discipline and, therefore, having the Catapults working as a network will galvanise industry to work with them.

Lord Mair: What do you think about this third-third-third model? Might that change?

Dr Ian Campbell: The thirds model is there for good reason. It balances the interests of the Catapult and of businesses, and it makes sure the Catapults are relevant to business. The challenge that we are faced with at the moment is that the middle pot—CR&D—is increasingly competitive. In the last year, we have had a rapid rise in the number of applications into Innovate UK for that collaborative research and development funding. There really is not enough of it to go round and to meet the commitment that the Catapults need in order to fulfil their thirds model at present, so we need an uplift in that collaborative research and development budget to make the thirds model truly work for Catapults.

Secondly, within Innovate UK, we have a lot of hypothecated funding. If we could bring the ring-fences down with that and allow the Catapults to apply to more of these areas through thematic calls, it would be more successful and more realistic to achieve the thirds model going forward.

Professor Dame Ottoline Leyser: I would emphasise the points that Ian just made so well to do with increased flexibility in the overall innovation budget for Innovate UK, so that they really have the opportunity to put into the system the right money in the right place at the right time. They are very constrained at the moment, both in the size of their budget overall and in the level of flexibility that they have to allocate it in the most effective and efficient way. That is the one of the key things that need to change in really joining up our system in the way that it needs to.

Q3 **Lord Borwick:** Which Catapults have been most successful in catalysing increased investment from the private sector? What is the most successful commercialisation so far?

Professor Dame Ottoline Leyser: It is quite a difficult question to answer, because they are in such different stages of their growth and development. At the ends of that spectrum, in some ways, are things like the Advanced Manufacturing Research Centre in Rotherham, which has just done an extraordinary job of regalanising industry in that region, attracting huge amounts of investment from major players such as Boeing in that sector, and really providing for that local economy in an extraordinary way. One of the things that they have done, which is a particularly interesting development for the future, is to build into that a skills development programme to drive up local absorptive capacity, which has been a key part of generating that amazing cluster right there.

Much more recently, the Cell and Gene Therapy Catapult has been incredibly successful in creating a similar cluster around its major centre

in Stevenage. Both those Catapults have really brought in a very substantial amount of commercial investment and built that industry around them.

We are also very excited about the advanced Compound Semiconductor Applications Catapult. It is a fairly recent one in Wales, but there is every indication that that will have that similar clustering effect. I would certainly welcome Ian's input on these; he is really on top of all the details of which ones have done what, where and when.

Dr Ian Campbell: If you look at it based on the thirds model, the most successful has been the High Value Manufacturing Catapult. That is not too surprising, because it already has a huge asset base that industry would like to access. Last year, it brought in revenue of £112 million through its commercial endeavours.

I agree with Dame Ottoline that the cell and gene therapy sector has benefited most from the Catapult, but that is historical. If you go back to 2009, when Innovate UK ran a regenerative medicine programme, very few companies at all were being funded in that area. If you fast-forward to today, we now have a Catapult, a manufacturing centre and a cluster in Stevenage that is the second largest in the world. Over 14% of clinical trials in advanced therapy are now being done in the UK, and we are seeing biotech companies moving from the US into the facility in Stevenage to take advantage of the facilities. If we look towards the future, the Cell and Gene Therapy Catapult has done particularly well.

Q4 Lord Browne of Ladyton: This question is designed to invite both of you to look forward. What new developments in science and technology hold most promise in their ability to be commercialised and to deliver significant private sector investment? Consequently, should we develop new Catapults from that information? If so, in what areas?

Professor Dame Ottoline Leyser: There is a range of different ways of thinking about this question. We are in a lot of discussions about a whole group of things that one might call transformative technologies that have incredibly general applications, the obvious one being in AI and machine learning. It is a different kind of thing, because in principle that approach is applicable right across the system. It is not a particular industry or business sector; it is everywhere. That is a new challenge, in many ways, in how one connects the discovery research space, which is very heavily in industry itself, with the academic research space, into the incredible breadth of industry that could benefit from that type of platform technology. There are several things in that category.

There are a lot of very interesting developing fields in what is now being termed engineering biology; it is an evolution of synthetic biology. There is a whole range of things in the bio-based economy, where there are very substantial opportunities, particularly in the context of trying to decarbonise, to replace a huge number of industrial feedstocks that have traditionally come from fossil fuels, which are historical products of photosynthesis from millions of years ago, with much more modern products of photosynthesis, through different kinds of biological

feedstocks of one kind or another. That is an interesting and exciting growth area with quite wide application. In that case, the applications will be more targetable at particular areas.

I would highlight those things, but science is very exciting at the moment, so there are many opportunities for really generating value for our economy and our society from a huge range of activities.

Dr Ian Campbell: With the target of being net zero by 2050, one area that is ripe for exploitation, with the great science that we have in the UK, is the use of hydrogen and carbon capture and storage. That is in both the generation of green hydrogen and the storage and use of it as a power source going forward, whether in domestic heating in gas supplies or, indeed, to fuel our transport as we look for ever greener, ever cleaner ways to do that. The UK is well placed to do that.

Where a Catapult is formed, if it has a specific mission and purpose, it tends to be far more successful, because you get that focus on the challenges that it is trying to solve. The other health warning that I would add is that we have an awful lot of established infrastructure in the UK that is not Catapult-related at the moment, and we need to weave that in. National labs, public sector research enterprises and the institutes that UKRI funds through the research councils can all play a role in galvanising that together. Before we look at new Catapults, we should also do a stock-check to see how we can interconnect the current system that we have more effectively.

Professor Dame Ottoline Leyser: I very much took the question “What is happening that is exciting and needs to be considered?” from an innovation point of view, not about what new Catapults we need. Those are very separate questions. I completely agree with Ian that one always needs to think about horses for courses and not reach for some particular measure. One needs to think very carefully about how best to create the connectivity and add the value that is needed, depending on the particular innovation in question.

Lord Browne of Ladyton: Before we look for new, shiny, fresh things, we should look at what we already have.

Dr Ian Campbell: Yes, or gestate shiny things that we already have, so that they can learn from the lessons of others who have gone before, so that we do not repeat the same challenges when, for example, we start up a Catapult.

Q5 **Baroness Hilton of Eggardon:** The R&D Roadmap refers to a limited number of large organisations in limited sectors, but innovation often occurs in very small organisations. I wondered how much the Catapults manage to relate to small, innovative organisations and whether more should be done to incentivise the Catapults to deal with those.

Professor Dame Ottoline Leyser: That is a great question. One of the key roles of UKRI as an organisation that really spans the whole research and innovation system is to use its reach across the system as an intelligence-gathering exercise and to be really alive to what is new and

happening and where it is. That is not necessarily in a big, loud place; it might easily be in a much smaller, less obvious area. That is part of our key role as an organisation.

I agree that a key element is then to bring forward those exciting new ideas and to connect them into the system in the most dynamic way possible. Catapults have a key role in doing that because of their role as nodes in that connectivity. There has, indeed, been a lot of interest in how one builds the interaction between Catapults and the full system, including small and medium-sized enterprises, and there are a whole variety of things in train.

One of the things we are piloting this year is the so-called growth support account, where SMEs that have received Innovate UK funding receive at the same time a package to connect them with the right Catapults and all kinds of valuable advice on scale-up and those kinds of activities. We are absolutely focused on making the best use of Catapults for the whole innovation system, not simply for de-risking for quite large, established companies, and I am sure Ian would have important things to add to that.

Dr Ian Campbell: I have a couple of observations. The Catapults were set up, if you look back to the Hermann Hauser report, really to bridge the gap between translation and commercial exploitation. Catapults such as the High Value Manufacturing Catapult are clearly at the later stage of development when looking at manufacturing, but if you look at the broad spectrum of Catapults, they have supported many thousands of SMEs. The big challenge has been in securing that funding for SMEs to take the risk, which goes back to the point I made earlier about having enough collaborative research and development funding available for SMEs to apply for in order to work with Catapults to succeed.

The other role that the Catapults can play is not a financial one. It is to help them with their business support: to work with the regulators and with the policymakers and to really influence the innovation landscape to allow companies to adapt and change as they move forward. One example is the Cell and Gene Therapy Catapult. When it started, it took roughly two years to get clinical trial approval in the UK. We are now down to less than six months, and sometimes less than six weeks, for approval for clinical trials using advanced therapies, in part based on the work that the Cell and Gene Therapy Catapult has done with organisations like the MHRA. It is very much about influencing the regulators and the policymakers, alongside providing direct support to the companies.

Q6 Lord Hollick: Dame Ottoline, you explained in your opening remarks that one of the roles of Catapults was to promote connectivity. How successful have they been in promoting connectivity with universities? What more could be done to involve universities? Dr Campbell, what can Innovate UK do to help get universities more involved? Is there some sort of incentive or encouragement that they require?

Professor Dame Ottoline Leyser: This is a really important question and something I am really interested in improving in a variety of ways, not just in the context of Catapults but more generally. In the context of Catapults, there is a huge diversity of levels of engagement with universities. Some of the Catapults, particularly in the original high-value manufacturing family, are physically part of universities, but the question that you talk about is much more general. It comes down to the real problem that we have of Balkanisation in our system, which is why I am so keen to promote connectivity.

A lot of the incentives for researchers in universities are currently too strongly aligned with publishing papers in high-impact journals and not sufficiently strongly aligned with a much wider range of activities. There are, of course, incentives to support that kind of commercialisation and relationship-building with wider stakeholders in business, but they are not strong enough and are viewed as add-ons rather than a fundamental element of what a university should be doing.

A lot of this comes down to the difficulty we currently have in building incentive structures that support diversity and portfolios of activities with different people, institutions and departments, at whatever scale you look in the system, whether you are operating at an institutional, sub-institutional or individual scale. We need to think much more about portfolios where particular people and organisations specialise in particular areas, and where that specialisation is valued and supported.

At the moment, we run very heavily on an open competition-type system, where the rules for winning the competition are quite narrow, which drives homogenisation. We have to think quite intelligently about how we diversify our system to capture all the things that it needs to do in a way that allows specialisation of different parts of the system to deliver parts of those functions that we need.

The question you ask is really quite fundamental to how we view the incentives that work right across the system. We need to think about it in that broad way, rather than just thinking about how we persuade universities to talk to Catapults. It is a much broader question and there are quite a range of levers that we have to look at to incentivise that kind of activity.

Dr Ian Campbell: I will start by supporting what Dame Ottoline has said and then go one step further and say that all Catapults have relationships with universities. Some may be stronger than others. For example, five of the seven high-value manufacturing centres are based in and part-funded by universities, so there is a good swell of that to start with. There are then very specific examples, such as the academic alliances that the Connected Places Catapult has with Leeds, Nottingham, Cranfield and Birmingham, so there are pockets of it happening today.

The bigger challenge is that Innovate UK absolutely knows that collaborative research and development yields better results. A simple analogy is that, if you put two great brains on to the same problem from different perspectives, they will yield interesting results. Therefore, Innovate UK's funding in collaborative research includes academic

partners many times over. For example, 25 of the top 27 recipients of Innovate UK funding by volume are universities, so that collaborative element does work.

The challenge for Catapults is that they can access a maximum of 30% of the CR&D pot for a particular project, so they are limited in what they can take on.¹ Secondly, they can really only go after the Innovate UK CR&D pot rather than the broader research council funding. If they could access collaborative academic research funding through the research councils being less ring-fenced and more available, clearly they could have more of a disruptive effect, but that has to change over time. Right now, the Catapults are applying for CR&D funding solely through the European Union or Innovate UK.

Lord Hollick: Could Catapults significantly increase the funding available to universities for projects if they had a stronger relationship with the very large pool of venture capital that exists in the UK? That would certainly attract universities and incentivise them to connect with venture capitalists.

Dr Ian Campbell: I would support that. I would also make an observation: companies that are being supported through early-stage Innovate UK funding are more likely to raise venture capital privately, so you get a virtuous cycle of that money going round because there is more confidence in the system to invest more in it, and suddenly you get a better output. We need to catalyse that activity and create an ecosystem where public funding leverages private funding across the piece.

One of the things that Innovate UK has tried to do to help navigate that is to introduce investor partnerships, where, alongside our grant funding, we would allow a venture capitalist to come in and fund the company directly. If they believe in the management and infrastructure, et cetera, and Innovate UK thinks that the project and the people are innovative, there is a marriage there. We have seen a huge increase in appetite for that over the last couple of years, to the point where we have a number of investor partnerships across key thematic areas that have involved Catapults at one level or another.

Q7 Lord Kakkar: I should declare my interests at the outset as professor of surgery at UCL and a member of the advisory board of the Royal Society.

On the question of how Catapults might facilitate the Government's

¹ Innovate UK's purpose is to drive productivity and economic growth by supporting businesses to develop and realise the potential of new ideas, including those from the UK's world-class research base. The eligibility criteria for Innovate UK's funding schemes are designed to align with this purpose and enable businesses to collaborate with the research base, including Catapults. Innovate UK set 30% as the limit for research base partners within a collaboration to ensure that the majority of the funding goes to businesses and that the innovation is truly business led rather than a research project with industry as a minority participant. Innovate UK has increased the cap in a small number of competitions where there was evidence that earlier stage research would be beneficial, or where more intensive collaboration between business and academia was an explicit goal.

levelling-up agenda, is there evidence that Catapults have, to date, contributed to that agenda? In particular, what is the evidence about their geographical spread and capacity to contribute to driving the levelling-up agenda and reducing regional inequalities in R&D spending? How well are they able to work across regions in driving that specific objective? To what extent have Catapults been able to engage with other schemes, such as the Strength in Places Fund?

Professor Dame Ottoline Leyser: That is another excellent question. Again, one needs to think about this in a horses-for-courses way. Depending on what kind of gap the Catapult is trying to bridge, there is more or less opportunity to link that straightforwardly to local and regional growth and innovation. The Catapults absolutely have a key role to play in the levelling-up agenda but not uniformly. They should not be seen as a knee-jerk reaction: "We need something to go on in this region so let's put a Catapult there". It needs to be done in an intelligent way that supports a broader agglomeration agenda.

That speaks very specifically to your point about the Strength in Places Fund. That is a key UKRI programme that is seeking to address this agenda by inviting collaborative bids from particular regions involving universities and, in several cases, Catapults; the Compound Semiconductor Catapult in south Wales is a very good example of that.

Considering those Catapult centres as part of a broader agglomeration agenda, we are working in partnership across local areas to deliver well thought through, nuanced and place-sensitive interventions to grow economies in particular places, taking into account all the things you need to drive that local growth, not just plonking money in or putting a particular type of institution there.

You have to consider the absorptive capacity, the transport links and all those kinds of things, rather than using a unitary intervention in an unthought-through way. In some ways that is an obvious thing to say, but it is important, because the levelling-up agenda is key. Doing it really well and carefully will be critical to building back better after the terrible economic shock that we have had through Covid.

Lord Kakkar: Is what you have said, about the sensitive and fastidious approach that needs to be taken with regard to the distribution of Catapults and their creation in different regions, properly understood? Do you think, if I have understood you correctly, that the Strength in Places Fund will be the mechanism by which we can be reassured that the establishment of new Catapults is integrated into that broader consideration that you described?

Professor Dame Ottoline Leyser: The Strength in Places Fund is a really high-quality example of how to think through that broader agenda really well. It is a key pillar of the overall levelling-up agenda that brings local expertise and local understanding of what is needed to bear on building economies right across the UK. The short answer to that question is yes, that is a really important pillar.

Is that sufficiently broadly understood? There are a lot of competing interests in this area, quite obviously. It is a good thing that such an excellent group of people as are on this call has some influence on the policies that emerge.

Dr Ian Campbell: As well as the highlight that I gave earlier of cell and gene therapy and the cluster that has been created in Stevenage over the last five years or so in advanced therapies, I would also like to point to the Orgreave Colliery site, which is completely unrecognisable from what it was in the mid-1980s, with the likes of Boeing, McLaren and Jaguar Land Rover all having R&D facilities right next to the AMRC facility in Rotherham. Yes, it can be achieved, but it can be achieved over time.

I would also highlight that, although Catapults are centralised in a headquarters area, they also spread out. For example, the Digital Catapult has centres in Bristol, Belfast and Scotland, and they have the immersive hubs working across the UK to create new technologies for the creative industries, so it can be done. Again, although the Offshore Renewable Energy Catapult has its headquarters in Strathclyde, its main operational site is in Blyth. It also has facilities in Fife and down in the south-west, so they reach across the country.

However, that in itself does not form a cluster; you need the skills, the business interest, the transport, as Dame Ottoline said, and the links to academia to allow that continued diffusion of knowledge into the system at the levels that are required to create the capacity to allow businesses to flourish in those areas. It is a whole-ecosystem challenge, but the Catapults, with their technologies and skillsets, can definitely play a key role in helping to level up.

Q8 **Lord Borwick:** Dame Ottoline, the Ernst and Young report to BEIS that came out a couple of years ago about the different Catapults had various good suggestions in it for comparing them, such as efficiencies and percentage of overheads. Have those recommendations been taken up by BEIS? Do you get copies of those KPIs?

Professor Dame Ottoline Leyser: All the Catapults report in against a whole series of KPIs. Indeed, there are regular reviews and the relevant boards get access to those. Ian will swoop in with the details. The whole issue of KPIs is very interesting, because it is another one of those areas where, if you are not careful, you try to establish a set of uniform KPIs that are not actually sensible, because different Catapults are at different stages in their development and different industries are at different points in their adoption. Those direct comparisons are not necessarily as useful as one might imagine.

In terms of incentivising and driving particular behaviours in particular Catapults, again we need to think much harder about putting in place the right performance measures that really support the appropriate incentives at the appropriate times.

Dr Ian Campbell: All the recommendations of the report were adopted in full. However, trying to have standard KPIs across industries that are as diverse as digital and cell and gene therapy does not offer them the

best chance to flourish, because we are trying to squeeze them all into one evaluation pot.

I am pleased to say that with the new grant funding agreements we can actually allow them to develop KPIs jointly with Innovate UK and UKRI that allow them to specifically measure what they are doing with the core grant and how they are delivering against those milestones. That will better reflect the positioning of each, because it takes 15 years to get a cell and gene therapy into the market. It may take six or nine months to get a digital product to the market, so we have to have the right KPIs and measures to allow them to flourish.

The Catapult network has been subject to a number of reviews over recent years. I would like to see less reviewing and more enabling the Catapults to flourish. As my chairman said to me, it is a bit like planting a tree and digging it up to see if the roots are still there. We have to allow them to build and substantiate themselves as a core part of the ecosystem going forward.

Lord Borwick: I understand and agree with that. Are you going to publicise the figures that you said will be provided in due course, or are they confidential to Innovate UK?

Dr Ian Campbell: As part of our overall reporting, we will report them at a higher level. Clearly, the other thing we have to be mindful of is that Catapults themselves are private companies and therefore publish their annual reports and annual accounts. A lot of their success stories are captured in annual reports², as you would imagine, but they also detail the financial breakdown in spend, or successes in collaborative research and development, for example. Clearly, the nature of some of their interactions, because they are with companies, is commercially sensitive, so that has to be guarded at the same time.

Q9 **Viscount Ridley:** I am a member of the Regulatory Horizons Council and the Innovation Expert Group at BEIS.

In answer to Lord Hollick, Dame Ottoline said that we need to look again at the incentives that are provided for university research, to make sure that they are aligned with the right kind of thing. Can I ask an almost philosophical question about the linear, spin-off model? Ideas start in academia and then get applied in industry, but we all know that this is not necessarily the way it always happens. It quite often goes in the other direction. For example, thermodynamics came out of the steam engine rather than the other way around. Much more recently, CRISPR gene editing owed a lot to work in the yoghurt industry. Are the Catapults helping to get universities to think in terms of solving problems that are discovered in industry rather than the other way around?

Professor Dame Ottoline Leyser: I completely agree with you. Our difficulty in moving away from that linear model is seriously constraining

² For example the Annual Catapult Impact Report <http://catapult.org.uk/wp-content/uploads/2020/12/Catapult-Network-Impact-Brochure-2020-FINAL.pdf>

the way we think about building a high-quality research and innovation system. That is key to moving forward in the most effective way. The Catapults indeed provide a key element that brings together those permutations and combinations of people and allows the information flow in all directions, which is crucial, and builds relationships.

The other real problem in shifting this whole space has been that we focused so hard on particular kinds of efficiency in particular parts of the system that we have underinvested in the kinds of activities that we need to join it up. They do not look productive; talking to somebody else does not look like you have produced something, but three years later you remember the conversation and you know where that expertise is.

We need to be much more bold in investing in time for people to engage with much wider communities and to build those kinds of long-term relationships and to network. The Catapults provide a key role in that, along with shifting career incentives to promote much more mobile careers, where people move through the system in both directions. Again, that will help to close this notion of a linear model. At the moment, if you move from academia into industry, it is very hard to move back again, which somehow supports this idea that everything goes in one direction. We need to get that multi-directionality much more hardwired into our system.

The Chair: It is the Stanford model and how successful that has been, with academia to industry and back to academia.

Professor Dame Ottoline Leyser: Yes.

Q10 **Lord Mair:** Just before coming to my main question, could I return to the point that Dr Campbell raised about having too many reviews and KPIs—key performance indicators? In quite a number of the written contributions and written evidence we have received from Catapult, the point was made that the current KPIs focus much too strongly on quantity rather than quality, thereby incentivising Catapults to engage with lots of different organisations simply to get the better result in terms of the KPI. Would you like to comment on that?

Dr Ian Campbell: That observation is correct, and we need to be able to measure the right things for the outputs of Catapults. There needs to be some thought given to what we can expect to achieve over a five-year period within the sectors that they are trying to support, and that should be reflected in the KPIs. Under the current rules that were adopted following the EY report, it is very clear that we are trying to treat all Catapults the same. They are not equivalent; they are completely different. The High Value Manufacturing Catapult is significantly bigger than any other Catapult and should be measured in a different way. We need to get the KPIs correct for the industries and the sectors that they are trying to serve, and it should reflect the quality.

I would also like to see us focusing on the capacity of businesses in the sector to scale. Where do we truly have that UK leading academic excellence in the sector, and how do we translate that into knowledge

and then products and services? We have to look at the scaling agenda rather than just supporting SMEs. I would rather look at business growth as being a key measure for Catapults and the success of Catapults.

Lord Mair: What needs to be done? How would these KPIs be changed? How quickly could that happen?

Dr Ian Campbell: That is happening now because, as a result of the Catapults being private sector, we have had an ONS review that has led to us redrafting the grant funding agreements. Innovate UK is responsible for measuring the activity against the core grant, and each core grant will have KPIs that are dedicated to the needs of the Catapult and the outcomes and outputs that we are expecting from them. That is being done now and will be in place, I hope, by the end of April 2021 at the latest.

Professor Dame Ottoline Leyser: Maybe in a more philosophical way, as Viscount Ridley pointed out, this monitoring and evaluation element for the entire research and innovation system is really important, and the whole notion of a KPI is in some ways problematic because it drives one to think about a unitary quantitative measure, which is quite often not able to capture what we are interested in capturing.

I was very interested by something that emerged from the spending review documentation about a shift in value-for-money assessment that is based more on outcomes than on the various process issues. If we can move to thinking about outcomes and how one best captures outcome measures, that will be really important in not driving perverse incentives right across the system.

We also need to be braver, almost, in not requiring demonstration of a direct connection between a particular input and a particular output, because, in any of these complex systems that we are talking about, in tracing that linear connection we are back to the seductive lure of linearity in systems that do not really have linearity. We need to be much braver in focusing on outcomes for things that we really care about and collecting evidence that our inputs definitely influence those outcomes, but not requiring that direct linear connection that we seem to be so fixated on at the moment. It leads one astray, and then you wind up with perverse incentives that do not support the outcomes that you are interested in.

Lord Mair: Dr Campbell, what will be the contribution of other Innovate UK initiatives to the UK R&D ambitions? How do these other initiatives compare in scale and scope to the expected contribution of Catapults?

Dr Ian Campbell: Innovate UK has to provide a balance of what I would call funding and support. The support element given through the Knowledge Transfer Network and the Enterprise Europe Network, et cetera, is equally valuable for small businesses trying to navigate quite a complex system. We need to place more emphasis on the power of connectivity, creating the right collaborations and right partnerships before we even spend a penny.

When it comes to funding, we need to look at ourselves as an investor and take an investor-type approach. It needs to also be balanced. Innovate UK should provide support through grants, through the investor partnership/equity model and through loans. We launched innovation loans a couple of years ago to help those companies that are at the later stages of TRL to get over the line to become commercialised. That has to scale because we know very much that, when it comes to the adoption of new technologies and products, producing them to the right standards and specifications and getting them marketed is as important as the initial steps in the R&D, so we have to have that later-stage loan funding.

On the early-stage funding of ideas, we should always be a funder that takes risks, and we should take risks where others would be reluctant to go and provide that additionality. I would like Innovate UK to be able to see a return on that, should we be very successful over time and create a unicorn. Could the grant be paid back? Could we convert it to equity? That is very valuable.

The third and most important piece is that, to get to 2.4%, we have to incentivise private investment. I would very much like the brokering of Innovate UK public funding with the venture capital funding to allow us to finance companies that have the potential to grow in scale and facilitate them to do it. I used to run a start-up company, and I used to tell the story that I spent nine months of the year trying to raise money, a month congratulating myself that I had raised the money and two months preparing for the next nine months. That is not the way to grow businesses. We need to create a funding continuum that is partly reliant on public support to get it started but then allows the private funding to take over. We need to provide confidence to the private sector to take those early-stage ideas and translate them through the system. That would be my big wish for Innovate UK support in the future.

Lord Mair: If there was one thing that you would like to see recommended by our Committee, what would that be?

Professor Dame Ottoline Leyser: As a systems person, I always have a problem with "one thing" arguments, because one almost always needs multiple small interventions.

The Chair: I thought you suggested that the model of Catapult was the way to go for research and innovation.

Professor Dame Ottoline Leyser: I said that it was a key element in the system. My one thing would be to stop the endless reviewing and try to let the system that we have built deliver in a constructive way.

Dr Ian Campbell: We keep on looking over our shoulders at the Fraunhofer and wondering why Catapults are not quite like Fraunhofers. Let us give them long-term funding, make them part of the system, commit to supporting them, galvanise the system around them, provide them with clarity of funding, get away from reviewing and support them to be successful, because if you are looking over your shoulder and worrying about what you are doing and when it will be reviewed, you will not be focusing on delivering value.

We need to give them long-term stability in the system. There needs to be sufficient collaborative R&D support, and we already know Innovate UK only funds 15% of business-led applications it receives. If we got to 30% and had Catapults working alongside these companies, we could get to 2.4%, and that is the outcome we are looking for.

Q11 The Chair: UKRI has got more funding through the spending review, so maybe your wish might come true, Dr Campbell. The way you answered that question sounded as though you would much rather we had a model like the German model rather than the Catapult model. Do you have a comment about the Strathclyde model?

Dr Ian Campbell: No. Our model is similar to the Fraunhofer, except they have both federated and regional funding. The challenge we have in the UK is that we are an island. We have finite resources, but we have excellent academic outputs that could be translated into great products. The balance of public and private support in the ratios that we have today is just too low to stimulate business growth at scale. If we want to be a knowledge-led economy, we will have to fund it with that in mind.

I recall the story that if we put £1 into research and £10 into development, we need to put £100 into innovation. We need to balance the public and private and look at innovation as a discrete science in itself that we fund that allows the early-stage research to be translated into meaningful products. It is not about a German system or a UK system. It is about the fact that we are trying to deal with a non-linear model. We need to take more risks and provide assurance to the big infrastructure projects that we have in order to allow them to flourish.

Professor Dame Ottoline Leyser: The opportunities now to build the kind of system that we need are very strong. The instabilities that we have are very worrying, but they are also an opportunity. If the Government genuinely commit to the £22 billion uplift that we are hoping for over the next few years and we deploy that in a really intelligent way, as Ian has described, we have the opportunity to build forward in a very constructive way for the whole UK. I am really excited about the possibility of helping to deliver that.

The Chair: Thank you very much to both of you for coming. It has been a most interesting session today. We wish you well, and I hope our inquiry helps you going forward.