



Science and Technology Committee

Oral evidence: [Managing intellectual property and technology transfer](#), HC 755

Wednesday 14 December 2016

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Members present: Stephen Metcalfe (Chair); Victoria Borwick; Jim Dowd; Dr Tania Mathias; Graham Stringer; Derek Thomas.

Questions 199 - 272

Witnesses

I: Mark Anderson, The Law Society IP Law Committee, and Dr Daniel Nelki, Science to Health Lead, Wellcome Trust.

II: Professor Dame Ann Dowling, President, Royal Academy of Engineering, and Professor Trevor McMillan, Vice-Chancellor, Keele University.

Written evidence from witnesses:

- [Wellcome Trust](#)
- [Professor Trevor McMillan](#)
- [Royal Academy of Engineering](#)

Examination of witnesses

Witnesses: Mark Anderson and Dr Daniel Nelki.

Q199 **Chair:** Good morning and welcome. Thank you for joining us. For the record, would you please state your name and who you represent?

Mark Anderson: My name is Mark Anderson. I am a solicitor in private practice and I am the current chairman of the IP Law Committee of the Law Society of England and Wales.

Dr Nelki: I am Daniel Nelki from the Wellcome Trust. I work in the innovations division at Wellcome. I am a scientist and a lawyer. I have been working on a project called Science to Health over the last year within Wellcome, which is about this space.

Q200 **Chair:** Thank you very much. As I said, welcome. Mr Anderson, there can be a lot of contentious issues involved when negotiating deals around the transfer of IP and so on, and the valuation. Can you explain to us where the biggest problems lie? Is it the valuation that universities place upon IP and the allocation of equity—all those sorts of issues? Could you talk us through that?

Mark Anderson: Are we talking about spin-out transactions?

Chair: Yes.

Mark Anderson: The biggest issues probably come at an earlier stage of finding the right people to invest in a company. Over time sometimes spin-out companies are the routes that universities take; sometimes it is just licensing to a big company. It partly depends on what the investment climate is at the time and how much money is available for new ventures.

With regard to the actual negotiation, part of it is just educating people who perhaps have not done this type of deal before in some of the issues that are there, and having a kind of reasoned basis for share allocation, for example. Not every deal is the same. Sometimes the individual academic inventors will have contributed a lot. Sometimes they will be using university IP as well. It just depends on what the overall structure is.

Yes, there are sometimes difficulties over negotiating shares, but it is a negotiation. Inevitably, there are going to be difficulties sometimes. I do not think it is any worse than if you had a business-to-business transaction where you might have negotiations.

Q201 **Chair:** Because every situation is unique, are there such things as examples of good practice? Are there things that can be done better, or do you just have to approach every deal as a clean sheet of paper and start afresh?

Mark Anderson: One thing that can be done is to have a proper valuation process done by the university. As I understand it, not all



universities have that kind of formal process. Some just take it as what feels right rather than going through a formal process, whereas I know that some of the leading universities have somebody who is dedicated to valuation and using standard techniques for valuation.

Q202 Chair: Presumably these spin-outs are new entities; it is new technology. How do you value that at that early stage so that everybody is satisfied that you are doing the right deal?

Mark Anderson: There is sometimes a kind of rough-and-ready approach. "Okay, you have some technology and we will give it an initial value of X, say a couple of million, unless there is some good reason to do something different." That is my experience anyway.

Dr Nelki: It is a complex space and different people use different mechanisms to do the valuations. Mark is right in saying that one of the issues lies around having that capability of people who can quickly assess the value of something and get it in a balanced place, where the people they are trying to license it to think, "Well, that is a reasonable projection of what that value might be."

One way of doing it is to anticipate what the market might be and what your market potential is. There are mechanisms by which you can do it, even with novel groundbreaking technologies. I would say that it is one of the areas that causes delay in the negotiation.

Q203 Chair: Does that vary from sector to sector? Is it easier to do in certain areas than it is in others?

Dr Nelki: Biomedical is where we specialise, so we are more familiar with that space, although more and more of our users—and that is a trend across sectors—are cross-fertilising one another. You are getting mathematicians working and so on. I do not think there are any sectors where it is easier to work on a valuation than others. I do not know what your view is, Mark.

Mark Anderson: No; I think everyone is different. I do not think it should be too much of a surprise that it is difficult to value something that is often an early-stage technology where you do not necessarily know what the products are going to be that come out of the research stage that you are at. It is not like valuing a product or a commodity. People need faith in what you are presenting, and sometimes there is a lot of discussion required to make sure that, say, the investors, the academics and the university are basing their assessment on the same criteria and same assumptions.

Q204 Chair: Once you are at the stage where you are negotiating, some academics have reported that universities have a strategic interest in pursuing one avenue of commercialisation over another, presumably to maximise their revenue. Have you found this? Can you give us any examples of where that might be true?



Mark Anderson: That is not my experience. My experience is that it is very much opportunistic: “We’ve got some technology. Let’s see what we can do with it. Let’s explore what possibilities there are.” There probably are not a vast array for individual projects. It is a case of finding one or two key players who might be interested. As I said, it is partly on what the investment appetite is for what, at the end of the day, is a very high risk investment. Is there money around at the time? Would it make sense to go down the route of a spin-out company rather than licensing to a large multinational? That tends to be my experience of the process.

Every university is different. We may come back to this, but sometimes I think that the criticisms that are made are not entirely objective. They may be based on people’s personal interests at the time. That may affect things.

Q205 **Chair:** That is what we try to get to the bottom of—whether we can find the evidence that backs that up. Thank you. Is that also your experience, Dr Nelki?

Dr Nelki: Yes. I do not have any examples of where overvaluation has been a specific issue, but there are complexities in negotiations. For example, you can vary your agreement depending on whether you want a return much later in the day or something up front, which is a preferred solution for some universities because they are, particularly within their university technology transfer offices, cash strapped and they would like to recover some of that cost early. It starts to creep into the flavour of the negotiation, shall we say.

It does vary across the board. Some are more interested in the long-term opportunities. Some may think, “If we can get a quick win here, then at least we have recovered our initial outlay,” because they have had to spend money on the patenting, forming the company and so on.

Q206 **Chair:** As the university presumably tends to hold the IP, do they call the shots? Are they the one in the driving seat?

Mark Anderson: My experience is that they call the shots initially, but once a serious investor comes in the investor calls the shots, because everybody listens to the person who has the money. Sometimes you find that the shareholders’ agreement and the articles of association are completely ripped up and they start again to meet the model that the professional investors are looking for, which can create some interesting conversations.

Q207 **Dr Tania Mathias:** Dr Nelki, I was interested in the Wellcome Trust plans about funding for biomedical technologies. I understand that the plans are to fund early and late stages of commercialisation. Can you explain that rationale and what it involves?

Dr Nelki: Yes. We have been involved in this space for quite a while now. We have developed a model which is what we called a “gap funder.” The problem we find is that the gap is very large. We find that we need to go



quite a bit earlier to help the academics. They might have something but they are not quite sure, and they need a little bit of help. They certainly need some guidance that they might have something and then help in understanding experimentation that they need to undertake. We need them to go earlier; and we are also realising that we get to a certain point in the development pathway where things then grind to a halt and we think that we need to go further into the clinical trial space, for example, if it is a drug.

As a consequence of us starting earlier and going later, we are going to have to narrow our scope, whereas before we have been prepared to be much broader. Having said that, we are intending to increase our funding in this space because it is a very important aspect of what Wellcome does. We see it as the mechanism by which we can fulfil our mission in terms of improving human health. The wrinkle that puts on the negotiations that we have or in which we are involved is that we will be prepared to do deals where the IP is made more available to the partner if they are going to address unmet markets. The developing world is a good example where some pharmaceutical companies may say, "I am not really interested in developing the product for that market." In our negotiations, we would encourage the companies and the universities to flavour the agreement so that we can cover more aspects.

Q208 Dr Tania Mathias: The early stage of that is easily understood, but is the late stage because they tend to be for the developing countries' market before the clinical trials?

Dr Nelki: No, not necessarily. It is still high risk and still novel, particularly in the space we work. We are not really that interested in doing another "me too" cardiovascular drug of some sort, unless it is a completely novel mechanism that has not been tested yet. It tends to be that those later stage investors are a little bit more wary of that space, which is why we find we need to go a bit later.

Q209 Dr Tania Mathias: Again in relation to Wellcome Trust, how will the innovation strategy be supporting commercialisation?

Dr Nelki: The spend on average has been about £80 million a year. We are increasing it to £100 million a year in the innovation space. We are going to be launching our new innovation strategy in the new year. It is going to be along the lines of earlier and later, but with a narrowed focus.

Commercialisation is an interesting term because, of course, that is not our driver. Our driver is the unmet medical need. However, we recognise that commercialisation, more often than not, is the route by which we can do that. We are very keen to support the commercialisation of the opportunity if that is seen as the best way of getting a product out at the end of the day. We will give support throughout the process if it is a project that we believe in.



One of the significant things we provide comes back to the point made earlier, and, to be frank, we can afford to do this. I work in a division of 30 people who are either like myself scientists and lawyers or scientists in business and have been there, done that and understand the pathway, and can help advise the researcher on the journey. It is not just about the money; it is about that capability and that expertise that we are able to help and support.

Mark Anderson: Not all universities have that.

Dr Nelki: Absolutely.

Mark Anderson: Wellcome is an example of good practice, in the sense that it has a large team of really high-quality people, both on the legal, commercial and technology side of things. That is not always the case, particularly outside the “golden triangle” universities. Some of them are lacking in that, but then they do not have the throughput of technology transfer activities that would justify having a large team of people.

Q210 **Dr Tania Mathias:** Going back, would you say your reason is not commercialisation but unmet clinical needs?

Dr Nelki: Medical need; health need. That is global for us; it is not just the UK, although the majority of our funding is still in the UK.

Q211 **Dr Tania Mathias:** We were told that in the UK there is a problem about what is called a “ladder of financing.” Do you have that experience?

Dr Nelki: I have read that too. My understanding of that is that it links to the point I was making about one of the reasons we have gone early and one of the reasons we have gone late. If you speak to some people, they will say financing is not an issue. I think it is not an issue if you have some really hot technology that everyone wants in on. As I say, in terms of new and breaking technologies that are not tested, there are always gaps along the journey. That is a fair comment. It is not steady.

Q212 **Dr Tania Mathias:** Do you think that is across all sectors?

Dr Nelki: I look to Mark to answer some of that because he might be more exposed to other sectors. You can make a quick return in some sectors on some of the technology and with less input in some ways—for example, in the digital dot.com type and website-type areas. They just need a virtual office somewhere and some bright minds to get things going. They need less heavy lifting. Biomedical by its nature is an expensive research development area.

Q213 **Dr Tania Mathias:** Would you agree with that, Mr Anderson?

Mark Anderson: Absolutely. For example, a couple of our biotech clients have moved a lot of their operations to the US, particularly to Boston. We end up on a purely personal level losing them as clients because they are basically fundraising and doing all their legal work in Boston. They might still have some residual R and D capability in the UK but a lot of their



activities have moved away, presumably because that is where they can get the funding in the US.

Q214 **Dr Tania Mathias:** That is a very good point. Do you think there are any barriers towards the relationship between SMEs and universities?

Mark Anderson: It is important not to treat SMEs as a single category. SMEs vary. Some of my biotech clients have gone to Boston and are listed on the London Stock Exchange, but they are still SMEs. They are highly skilled and they know exactly what they are doing. They take advice from the best people. There are also people who are just running a retail business somewhere with one outlet. There is a complete range.

The need for research support varies enormously as well. Yes, there are some inexperienced SMEs who do not really know what they want, but then would it be any different if they did the research in-house and then found that they are encountering some of the same issues such as, "What do we do about due diligence on third-party intellectual property before we invest in our research project?" That issue comes up whether they are doing it in-house or engaging a university to do the work for them. In the case of the university, the issue comes to the fore when you have debates in the negotiation of the contract about what promises the university should be making as to the absence of third-party IP. I think that is partly the issue.

Q215 **Graham Stringer:** Dr Nelki, can you explain to us what patent trolls are and whether they are of benefit to the world or are parasitic?

Dr Nelki: My understanding of patent trolls—and I have come across them when I was in private practice, so they do exist—is that they literally trawl IP databases, find some intellectual property that they think looks like it might have some value and approach the owner, and then approach the companies that look like they might potentially be using that technology and arrange licence fees with them. I do not think it is very common. It is much more prevalent in the US, for sure. I do not think they are healthy.

The experience I have had, again in private practice, where companies could afford to take this sort of thing on, is that they tend to approach, for example, a car manufacturer that they know has a lot of robotics. They will approach all the top car manufacturers because they have found a patent that has some robotic element to it. They will ask for a licence fee to access that patent. The view might be taken, "It is going to cost us more time and money to say no and litigate this than to just pay \$10,000 or \$100,000 so that we have access to it."

They do not do it in a blind way. They will have a bit of a look and then say, "They might have a case there. The patent might have some value. This might stand up." That is my understanding of trolls. You will probably be more familiar with them, Mark. You may have come across them more.



Mark Anderson: Certainly. It is a term of disparagement and sometimes people use the term “non-practising entity” as an alternative. The theory some people have is that, if you are not actually making and selling products yourself with the patents but you are merely using them as an asset with which to make money, then that is somehow a bad thing. Of course, that is what universities do, so by that standard all universities are patent trolls. Clearly that is not the right meaning.

I agree with Daniel. I think it is primarily a US phenomenon based on a number of factors such as the size of the market and the fact that companies are prepared to compromise and pay a fee, even though they are being held to ransom. There is the fact that you have jury trials. There is a whole range of aspects of US patent practice that make aggressive asserters of IP more of a phenomenon than perhaps they are in Europe.

Q216 **Graham Stringer:** The answer is that they are taking more out than they are putting back in, in terms of value. Are single patents becoming less valuable now? If that is the case, can you explain why and what the implications are of this change?

Dr Nelki: I am not sure I would have evidence to back that up in my experience. More often than not, we are dealing with single patents when we are licensing technologies. Occasionally we do get to the point that, if we have developed something far enough, it might be a handful rather than a suite or family of patents. I have read the suggestion that single patents are reducing value. We may have even produced a report where we have said that, but I am not totally convinced.

Q217 **Graham Stringer:** You do not really believe it is a trend.

Dr Nelki: I do not think so, no.

Mark Anderson: If we are talking, say, about a patent covering the chemical structure of a small molecule that is going to be an anti-cancer drug, then that one patent may be extremely valuable. I assume by “single patent” that we are talking about the same patent in all or most countries of the world.

Graham Stringer: Yes.

Mark Anderson: In some other sectors you get people building up portfolios of patents to trade with other people in patent pools, where the patents are a kind of bargaining chip to enable you to maintain a space in the sector. A patent is really being used for a different purpose there, I think. I have not personally seen any trend in that direction.

Q218 **Graham Stringer:** It is one thing having a patent; it is another thing defending that right. It can be very costly to do that. Are there any obvious ways that costs could be reduced?

Mark Anderson: Yes. If I could introduce a topical issue, the Intellectual Property (Unjustified Threats) Bill has just passed its Third Reading in the



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Lords yesterday and has come to the Commons. I would recommend that that be passed as an Act. It is something for which the Law Society has been campaigning for the last 10 years to make it more straightforward to prosecute patent claims.

Are there other things to make things more streamlined? The Intellectual Property Enterprise Court has been good in that respect. It has limited costs to £50,000. The speed of cases getting through both IPEC and the Patents Court in the High Court is very good. I think things are already being done to make things straightforward.

At the end of the day, patents are a highly technical subject and there is inevitably going to be some cost and complexity around them, no matter how much effort we make.

Q219 Graham Stringer: Do new technologies fit comfortably within the existing classes of IP protection? I am thinking of computer programs, software and that sort of thing.

Mark Anderson: Back in the 1980s when computer software came in on a major basis, we could, at that stage, have created a new type of IP for software. What actually happened—and everyone just gravitated towards this—was using literary copyright as the basis for software protection. That has its advantages and disadvantages.

Could we create some new types of IP? Yes. Is there any great demand for doing so? I am not sure I have seen it. I think the system is relatively stable. I do not think it is something one should lightly tinker with. Once you have a steady system and everybody knows where they stand, both creators and users of IP, then there is a stability in that system. That is just a general point, but I am sure there are areas where new technologies could benefit from new types of IP.

Q220 Graham Stringer: Is there any way of streamlining the steps that you need to take to establish IP rights? Could they be made cheaper or streamlined in any way? There is obviously a cost to innovation and taking products to market.

Mark Anderson: This comes up particularly in the context of patents. With something like copyright, there is no registration system and therefore there is nothing specific that you need to do other than keep records of what you have done. It is similar with trademarks. Principally we are talking about patents. Could the patent system be made simpler? Yes, it could but that is a worldwide exercise. A patent law internationally has become extremely complicated—in my view, too complicated. I do not see a quick fix way of dealing with that. I am also quite hesitant about suggesting that the UK should move away from the international system. A lot of IP transactions are international. I do not think having the UK out on a limb is a particularly valuable thing.

Q221 Jim Dowd: Following on from that, I do not want you to say anything too controversial but do you think the role of the Intellectual Property Office



is satisfactory and effective?

Mark Anderson: It is really important that it does not get distracted from its principal duty, which is as a technical office assessing and granting patents, trademarks and other registered IP. In recent years, people have said, "Okay, in Government we need somebody to be the experts on IP so let's get the IPO to do it." They have almost become a technical branch of the Department for Business, Innovation and Skills.

That is fine, but there is a bit of a tension there between their traditional technical service role versus a policy role. They need to make sure that they have the right people to perform both functions. I am not sure if that is answering your question.

Q222 **Jim Dowd:** Yes; if that is your view. Do you think there is a role for the IPO, or Government more broadly, to assist in defending IP rights, or is it just a matter for commercial law?

Mark Anderson: Yes. I think IP is a commercial asset and I am hesitant about the Government getting involved in helping people with their private rights in respect of commercial assets. For example, I am not sure it is a good use of Government money for the IPO to be providing in effect cheap or free advice on how to protect your IP. Those are ultimately private rights. I can see how it might have arisen. If you are a lone inventor or SME making an application, and you cannot afford legal advice or you are not prepared to pay for it, then you call up the help desk at the IPO and they are very helpful. I have been down to the IPO's offices in Newport and spoken to the people there. They do try to be helpful. I think there is a difference between that versus expanding into a kind of service provider. I am really not keen on that idea. I do not think that should be done.

Q223 **Jim Dowd:** I want to turn briefly to TTOs: technology transfer offices. What would be the defining characteristics of an effective TTO?

Mark Anderson: A multi-skilled, multi-tasking group of people who can both liaise effectively with academics and with university authorities, can market IP, can manage external patent attorneys and lawyers, and can negotiate deals. There is a huge range and it is a really skilled task. I think it is sometimes undervalued within universities. Sometimes, because there are not the clear guidelines in universities as to what their bottom lines should be and what they are expected to do, there is a muddle-through approach where you get a slightly unsatisfactory set of compromises that have not necessarily been based on principle but are more just on, "Okay, this is keeping the most number of people happy." That is not always the right way of going about things.

Q224 **Jim Dowd:** You bring me very conveniently to my next point. Is it necessary—and I think you have said it is—to raise the status of TTOs within universities? Having conceded that, how would you go about doing that?



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Mark Anderson: I think it starts right at the top of the university. One of the problems is that sometimes the TTOs are several steps in the management hierarchy away from the vice-chancellor. Personally, I would like to see the senior management team of the vice-chancellor include somebody who is responsible for this area, among other areas of engaging with industry, and who really understands it—not some senior dean who has been moved sideways to cover the area but somebody who has perhaps come from business and who really understands this sector. I think that would be a start in increasing the status of the TTO activity within the university.

There are lots of other things that could be done. For example, at a national level why not have a new royal academy for, say, innovation? That would enable senior people in the TTO community and senior academics who are perhaps involved in commercialisation activities to come together. If you a fellow of the royal academy of innovation, that could be an alternative career path to being a pure academic scientist who becomes a Fellow of the Royal Society, for example. Something like that might be useful.

Dr Nelki: Can I jump in—it might come up in other questions—in case it is missed? This is a very important element in these sorts of discussions around the culture of translation and innovation. I absolutely agree with Mark with respect to the seniority of a head of a TTO. One thing that struck me when we visited Boston, Stanford, Harvard and the places that are seen as role models in this space, was that the head of their tech transfer team sits next to the pro vice-chancellor of the university. They are next door to one another; they are not down the corridor, in the basement or somewhere far away. It is on that level of hierarchy.

Within that culture, whether you are in industry or academia, it is blurred. There is a revolving door of people who have gone into industry and come back into academia. That is something we are not very good at here. You are focused on your publication track record in order to get your next grant. Why should you lift your head up and start thinking about translation or commercialisation? It is not respected necessarily within all of the academic community.

Some of the changes we are hoping to make beyond the funding is to try to influence the culture and to ensure what we would call reward and recognition for academics who have gone and taken a spin-out, whether it has failed or succeeded. Failure is just as important to learn the ropes, as it were. They should be able to come back into the university and still get research funding, even though they have been off the publication track record.

There is something around the culture. Mark's idea of a new royal academy is one example of the sort of thinking we need to have to lift the respect for academics who spin out, or people who have not been academics but who have been very successful in industry and say, "I



want to spend some time in research.” They should be able to do that. The institutions then become peppered with those people, and it has a good influence on those around them and that degree of respect that is required.

Jim Dowd: Thank you for that. My final question was going to be on how the TTOs get this balance of academic and commercial experience. I think you have covered that in your answer.

Q225 **Derek Thomas:** The Wellcome Trust has highlighted the importance of establishing the regional technology transfer networks that allow resources and best practice to be shared. How do you see the development of these networks being facilitated?

Dr Nelki: It goes to Mark’s point about some universities not having the throughput or capability to deal with technologies and what we believe is the requisite expertise and advice that should be available. If you had some regional centres where that capability was there to be able to offer to local institutions, I can see that being hugely advantageous. Particularly within the biomedical sphere, where you need lab space if you are going to do a start-up, I can see that turning into incubator space—an area where people could not just go and get advice and expertise but do that experiment which they might not have the facilities or capability for within the university sector itself.

I can see it becoming a hub for capability, offering a number of services. That could also become a facilitator for bridging that gap between the SMEs and the universities. Again, I agree with Mark’s comment that it varies. We described it in some situations as a “problem finder.” Sometimes companies could benefit from advice, but they do not even realise they could benefit from it. If you have the expertise, somebody could come and work with the company and say, “Actually, have you ever thought about doing this? This is a problem that you could get fixed by working with university X.” You could create an area. It is something that Wellcome is keen on doing almost within its own building in relation to bringing people in so that they can discuss with relevant experts.

Q226 **Derek Thomas:** Who is best placed to make those networks develop and materialise, or even exist? Can you see who should do it or lead on that?

Dr Nelki: In the landscape? I think Innovate UK would be a good place to start. It would be good if the TTOs themselves were joined up in that.

Q227 **Derek Thomas:** In terms of the regionals, would you imagine that LEPs or something like that would drive it? At the end of the day these things will only happen if there is someone in the area who has that vision and drives the thing forward. There is no natural reason why someone based in the golden triangle would necessarily think, “Oh, we will go and do something in Exeter.” Do you see what I am getting at?

Dr Nelki: Yes. I would struggle to—



Q228 Derek Thomas: It is something that we can take away because we are quite involved in our local LEPs. I come back to the golden triangle. We have repeatedly heard that spin-outs place a high value on mentoring and advice, including legal advice, as they develop their company. How easy is it for an SME or someone to access this type of support outside the golden triangle? I do not mind who answers that.

Mark Anderson: There are experienced IP lawyers across the country who specialise in this area. I do not think that should be too much of an issue. I do not know about commercial advice. I am not entirely sure what commercial advice one would be looking for. I do not know because my experience has been mainly in the south, but I would be surprised if that is a major stumbling block to SMEs.

Dr Nelki: I agree. I think it is probably patchy. Some areas are probably stronger than others. In my experience, it relates to the calibre. That is our bias because we look to the universities where we fund, and that is where the spin-outs come from. The quality research institutes tend to have that around them and/or where there is an industry that still has that expertise in the vicinity.

Q229 Derek Thomas: In terms of the mentoring and the advice, it is for someone to just find out where it is and see what they can learn.

Mark Anderson: Yes. There are trade associations. For example, there is the BioIndustry Association. There are other trade associations whereby on joining that organisation you can tap into networks. I am not sure I can add anything to that.

Q230 Victoria Borwick: I want to go back to Dame Ann Dowling's review. One of the criticisms made was that the innovation landscape was far too complex. Have you seen any evidence at all that supports the fact that innovation has been simplified?

Mark Anderson: It is not something I tend to get involved with. The parties have generally sourced their funding before I am involved, so it is not really my area.

Dr Nelki: I think it has improved. There are multiple funders funding slightly different spaces of technology and slightly different stages. I can understand why an SME, particularly without that mentorship and expert advice that might not be available, could think, "I am not even sure where to start or who I should go to in order to get further financing?" There is a degree of complexity but it is improving. UKRI can bring it together. The research councils can bring that into Innovate UK and that may help. That is an opportunity potentially to simplify the interface, as it were. There is some evidence, but I would not say I have a lot of experience in it myself.

Q231 Victoria Borwick: The perception that the UK performs poorly when it comes to commercialising its research outputs has been around for decades. Based on your experience, is that still the case or is there



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something you would recommend that would move us all forward?

Mark Anderson: I suspect it is partly the size of UK industry. It does not necessarily always lend itself to international businesses.

Q232 **Victoria Borwick:** You mean a proliferation of smaller companies. We have some big ones here.

Mark Anderson: There are some, yes. My sense is that we have a world-beating university sector but not quite the same level of industry to match it. Why are we good at the first stage rather than the later stage? I think it is to do with the scale of British industry and its ambition. If you go to California or somewhere, there is a lot more entrepreneurial spirit and a lot more money floating around. People are ambitious, not just to make the first \$10 million but to keep going after that. It is just a different approach. I am not sure there is anything specifically that we can do, other than re-programme ourselves to be more raw capitalists, if you like.

Dr Nelki: I would agree with that. It is a bit of a stuck record. There are a few examples that people always cite for way back opportunities we have missed. I do think we punch below our weight. I am slightly biased because the Wellcome Trust is funding in this space and we think we have some of the best research in the world. That is why the majority of our funding stays in the UK. It could go anywhere in the world, but it stays here because it is where the best research is.

Against that background, we want to maintain that strong base of great research because allowing that research to flourish is where the great innovations come from. I would say that we do not allow ourselves to take full advantage of the potential of that research: to keep it here, not allow it to spin out and set up somewhere else but allow it to flourish and become the next GSK for the UK.

It is very exciting times for the UK now. We have a tremendous opportunity here. Everybody is beginning to align themselves—Government and the funders—recognising that this is potentially a really good resource of future business. One of the areas that Britain can sell itself on is intellectual capital. We are guilty of not fully realising our potential, but the time for that is good to change. We are ready for that.

Q233 **Victoria Borwick:** That is sensible. How could the Government's new industrial strategy challenge fund be effectively targeted to ensure that research takes place in the UK rather than overseas?

Mark Anderson: At the moment we know very little about what the fund is going to be doing.

Q234 **Victoria Borwick:** So it is early days.

Mark Anderson: It is pretty early days. I suppose it could put money into more of the technology transfer-type activities. There is already funding from different sources like HEIF that will fund some technology



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transfer activities. If we want to be really ambitious and if, for example, we want to have these regional hubs for technology transfer, they need to be funded from somewhere. That might be a possible outlet.

I am not sure there is a problem with the research side of things. I think it is taking it from the research stage through to commercialisation, so if there is a policy aspect directing, "How do we get the next stage of funding for technology transfer? How do we support the skills of people doing technology transfer? How do we educate people about the whole area of IP and technology transfer?", there is still a huge amount of lack of information among scientists and business people about intellectual property. Perhaps a useful outlet for funding would be some sort of national approach to training people in intellectual property. For example, why do we not have a short course in IP in every undergraduate degree in the country? It is that sort of issue.

Q235 Victoria Borwick: Finally, I turn back to procurement. I do not know whether you, Dr Nelki, might want to comment. What more can the Government do to encourage innovation and collaboration through its own procurement lines and contacts?

Dr Nelki: I am not sure I understand.

Q236 Victoria Borwick: We thought you might want to tell the Committee about NHS procurement views, which was part of the recent Accelerated Access review. Did you want to add any comments on that?

Dr Nelki: I am afraid I am not close enough to that aspect. NHS take-up is really important in innovation. We had a joint funding arrangement with the Department of Health called the health innovation challenge fund. It would be a good model for a challenge fund. We thought it was very successful because it allowed us to fund projects that we knew the Department of Health, and therefore the NHS, would be interested in picking up potentially, if you have some novel technology that comes out at the end of it, and using it. Without that joined-up element, we could have funded projects historically where we think there is a good innovative product here but the NHS just are not interested in trying that and experimenting with that, which it would necessarily need in order for it to—

Q237 Victoria Borwick: So the difference between the two challenge funds is that one had a fixed objective.

Dr Nelki: It was more that the Department of Health was already involved, so it already had an appetite. If it was funding something, on the whole it should be interested in using the outcomes of that research. It was already interested in the project. I would not say it was mixed as such, but certainly their engagement meant that there was more likely to be a definite appetite for the product than there would otherwise have been.

Q238 Victoria Borwick: And we do not have that yet in the industrial strategy



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one.

Dr Nelki: I do not think so, no, not yet. We were joining things up a little bit more closer to the potential end user.

Q239 **Victoria Borwick:** So that is still the gap.

Dr Nelki: Yes.

Mark Anderson: I have one point to add to that. We should not overlook the fact that Government is a major purchaser of research services. The approach that is taken by different Government Departments varies quite a bit on IP. For example, historically the Ministry of Defence has been very good at recognising that it is not in the best place to commercialise IP. Therefore, there has been a policy position for decades that the IP should remain with the university. If you go to the Department of Health, or some other Departments, where they have perhaps more of a procurement approach and a slightly tougher approach to life, it is a very different style of things.

My personal view is that Government Departments should not seek to be custodians of IP. They should leave it with the people who are better placed to deal with it. The universities would be a better place.

Victoria Borwick: I am sure that is good advice.

Q240 **Chair:** There are a couple of points I just wanted to follow up on, if I may. Mr Anderson, you mentioned IP short courses at universities. Are there other countries that do that, or is it just a suggestion for us?

Mark Anderson: I have not come across that. I know it is something the IPO has been looking at, but, as it would acknowledge, its role in this kind of area is more like pump priming than being a new national educator on IP. It has some materials. For example, it has a short 40-minute online course called "Introduction to IP," and you get a certificate at the end if you answer the questions. I actually did that a while ago.

Education in IP is an area that students are increasingly asking for, and I guess some areas lend themselves more to this than others: the science and engineering subjects and perhaps some of the arts and design subjects particularly. Yes, it is really just an idea for you to consider.

Q241 **Chair:** That is useful. California is often held up as the exemplar of how things can be commercialised, spun out and grown. I just wondered if it was something that was happening in the States.

You also talked about scale of ambition and perhaps how ours is not as great as that in California. Do you think that scale of ambition is hampered by the national psyche? Is it just in our very nature, or is it because in California there is a hothousing effect going on and you have lots of entrepreneurs competing with each other to be the biggest, the best and the brightest? Does that drive that desire to build a bigger entity than perhaps here, where you might sell out at £10 million and retire?



Mark Anderson: That could well be it. It is a bigger market. It is many times the size of the UK and there is a lot more money around. I have been told in the past that one of the reasons why there is a lot more money around is because there are a lot of doctors and dentists who have complete control over their pension funds. The tax rules are a lot more relaxed as to what you do with your pension pot and so they are putting a few million into high-risk ventures like this as a matter of course.

That might be a step too far for the UK—to have complete freedom to do what you like with your pension money—and perhaps people are not that rich anyway to have many millions to dispose of. That might also be a factor, but there is the clustering effect, which is important both at the research level and the end business level.

We have recently rented space at something called “WeWork” in London. It is a chain of incubator buildings that people can rent. It is often people in the IT sector, not the long-term life science sector. That sort of activity is really useful because it gets people together in the corridor discussing things.

Chair: Thank you very much indeed. That is very useful. I am sure you will look with interest when we bring some of these points to the Minister’s attention at our final session in January. Thank you both very much indeed.

Examination of witnesses

Witnesses: Professor Dame Ann Dowling and Professor Trevor McMillan.

Q242 **Chair:** Good morning and welcome. Thank you for joining us. For the record, could you please state who you are and in what capacity you are here?

Professor Dowling: I am Ann Dowling, president of the Royal Academy of Engineering. Good morning.

Professor McMillan: I am Trevor McMillan, vice-chancellor at Keele University but also chair of the group steering the knowledge exchange framework for HEFCE that it was invited to put together by the science and innovation strategy a couple of years ago and confirmed in the HE Bill.

Q243 **Chair:** Thank you very much. Dame Ann, you produced your report almost 18 months ago now, in July 2015. What grade would you give the Government so far for their response to that?

Professor Dowling: I would not presume to give a grade. I guess what is behind your question is that we have not yet seen a written response. Actually, I have had the advantage of seeing the draft response, which I have been told will be out this side of Christmas. If I turn it round more to substance—have we seen actions in response to my report?—I would



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say yes, we definitely have. On that basis, I think we are moving in a very good direction.

Q244 **Chair:** That is excellent; we all look forward to seeing the response to the report. One of the issues, as you will have heard, mentioned in the previous session was that you thought the structure for innovations was far too complex. Do you see some movement on that?

Professor Dowling: Yes, absolutely. The first mover was Innovate UK, who did much to simplify their programmes. They have now reduced the number of programmes and the number of schemes, and are much more clear about that. They also run a couple of open calls a year, not prioritised by sector. Innovate UK introduced, which was absolutely what we were looking for, their no wrong door policy, which means, no matter how a business first approaches them, Innovate UK internally will do what we refer to as hide the wiring and make sure that business is guided to the right part of Innovate UK seamlessly. That is absolutely a huge step forward. UKRI provides an opportunity to do that more widely than Innovate UK. The research councils still have a very complicated interface, particularly in their interactions with business, but Sir John Kingman, interim chairman of UKRI, has expressed a wish that UKRI adopts that same policy of no wrong door. If they manage to achieve that, that would be fantastic.

Q245 **Chair:** Although the response to the report has been 18 months in the waiting, you think it will be well worth the wait.

Professor Dowling: It is not so much that we have been waiting. Things have been happening, and science and innovation has been such a moving area of policy recently that there were earlier drafts of the response but they got overtaken by time because more things were happening. I am quite content that the written response is coming out later because it reflects things that have been happening in the meantime.

Another area in which Innovate UK has simplified is in much clearer badging and communication around their knowledge transfer network, which is now badged as Innovate UK knowledge transfer network and is working in a more joined-up way. Again, for Innovate UK, I would score 10 out of 10 on responding to the simplification.

Research councils could do a lot more. They still run different schemes with the same name, for example, such as the CASE awards, and I hope that UKRI will be part of making the research councils more joined up in the future.

Q246 **Chair:** I am pleased to hear such a positive endorsement of it. As I say, we look forward to seeing it.

Professor McMillan, your review concluded that universities have to develop their own individual technology transfer strategy that fits with their particular characteristics and circumstances. Are you not concerned



that that would then complicate things again—that that would be an additional complication rather than a simplification?

Professor McMillan: I prefer to think of it as to sophisticate the landscape rather than to complicate it, in the sense that it is inevitable that all universities will have different approaches. The portfolio in different universities will be different. My own university, for example, does not have an engineering department, so that will be a quite different environment compared with some of the bigger civics.

The regional environment is inevitably also critical; I suspect we might come back to this in terms of ecosystems. While we live in a small country, and I am keen that we should not think regionally about everything because the distances within the UK are not that huge, inevitably the environment that you are in immediately influences where it is easiest to make particular innovations.

The other side of it that we should not forget is that the whole landscape of knowledge exchange is very broad. This morning you have talked a lot about IP and technology transfer, but one point around the whole HEFCE exchange framework is that that is a very small part of what universities do to enhance the economic value more broadly through exploiting the research and indeed the expertise that they have within their walls.

Q247 **Dr Tania Mathias:** I have a cheeky question first to Professor Dame Ann Dowling but it is a yes/no answer. Do you know all the letters after your name off by heart?

Professor Dowling: Yes, if I put my mind to it.

Q248 **Dr Tania Mathias:** I just wondered. It is great to have you on the panel. Some universities have disputed what you said that they are prioritising short-term revenue gains over long-term knowledge exchange. Can you go through the evidence that led you to that conclusion?

Professor Dowling: Yes; I am pleased to do that. As part of my report, we consulted and collected evidence quite broadly. We had over 200 written submissions and then we engaged in round tables and in a workshop with 200 individuals in some in-depth conversations. As a result of those, one question we asked of business and universities—of anyone who wanted to respond—was what they perceived to be the main barriers to business-university research collaboration.

The No. 1 barrier as seen by business was IP arrangements and contracts. That was the No. 2 barrier as perceived by the academics. The evidence that we had—and it is quite substantial—was that the users, whether in business or universities, see IP as a problem. As part of the evidence gathering, we ran a round table of technology transfer officers, and I have to say they did not perceive it as a barrier, but everybody else involved in the system did.



As Professor McMillan has said, IP and contracts are much more than just what you do at the tail end in terms of technology spin-outs, and the technology transfer officers that you talked to were concentrating only on that end. There is the whole negotiation of IP around research grants and research contracts, and that was in some cases seen as such a barrier that businesses just walked away. SMEs were saying that, if they are confronted with a 50-page contract, they do not have the time or the resource to employ a lawyer to look at it; so they would frequently walk away at that stage.

As to how universities deal with the technology transfer at that final end when there is a result and it is a question of how one might commercialise it—that is what we were referring to when we talked about short-termism—technology transfer offices are quite often asked to bring in enough money to pay for their running costs. If they do that, they tend to look to shorter-term licensing than spin-outs, which have a much longer time to grow.

Also, we had evidence presented to us—indeed, outside the Dowling review, the Royal Academy of Engineering sees it through the support we provide to fellows in our enterprise hub—that some universities ask for such a high proportion of rights in spin-out companies that it puts off other investors. By asking for a big percentage, they end up with a big percentage of practically nothing rather than coming in at a smaller percentage, encouraging the academics involved to have a real element of skin and excitement in the game by having the benefits of a higher return themselves, but also keeping the door very much open for venture capitalist to come in because the universities are not being too greedy. They may say that they are being long term, but if they are asking for a high percentage of something that is long term, it is still with a short-term frame of mind.

Q249 **Dr Tania Mathias:** Thank you; that explains it. Did you find a difference in how the technology transfer offices operated according to their size?

Professor Dowling: There is huge variation across the country, and of course not every university can be expert in every sector. One thing we suggested was transferring best practice, and PraxisUnico certainly does an element of transferring knowledge, but it might be sensible for universities to work in groups so that, again, they share expertise.

We also thought that, if a university is proud of its technology transfer activities, it ought to publicise some of its data, partly to encourage the others, but also to show how good they are. One suggestion is that one might separate the university in which the discovery was made from the university or body that enabled the technology transfer by providing an element of competition there. Cambridge already does that. Cambridge academics are not forced to do their technology transfer activities through Cambridge Enterprise, although Cambridge Enterprise is there and it provides a good service. There is a free market, and that encouragement of competition can be very healthy.



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Professor McMillan: We talked quite a lot in my group around this issue of equity share, and one thing that is important is that it is a commercial negotiation. There are not many commercial negotiations where each side of the equation does not feel like the other side is being greedy in one way or another. Certainly, the experience that we saw round the table was that universities try to be very flexible and make a sensible evaluation of the level that is appropriate. In some, they will recognise that they do not need to put in very much input and therefore a 5% share might be appropriate; on the other hand, they might feel that they have had to put in a huge amount of input.

Clearly, one area we looked at was to try to compare that with the situation in MIT and Stanford, in particular, where we kept getting stories back that their equity share is very small. We very clearly got from them that we should not look to them as an example of what would work over here. They have a very particular environment in both cases where the university does not have to work very hard to commercialise a lot of the stuff. They send their guys over the road into Silicon Valley or wherever, and they can pick it up from there.

That tension in the system is inevitable and there needs to be clarity. There absolutely needs to be a transparency, at the very least, within an organisation so that the academics know why the university is doing what it is doing. I think that is absolutely critical, but, beyond that, this is always going to happen no matter what is put in place in terms of policy.

Professor Dowling: I agree completely with what Professor McMillan has said, but quite often people go into this negotiation and the academics can be quite naive in terms of what the offer is. Within our enterprise hub, we have found some enterprise fellows who did not even know it was appropriate to negotiate. Their university just said, "We are taking x%," and it is the only company that the academics have been spinning out. They did not know about flexibility.

We would like to see transparency about the deals and, if it is related to the amount of support they have had, just what the bounds are, because it is a really unequal negotiation with the university having the lawyers and the big guns; but what one wants to put focus on is jointly producing a successful company, and that ought to take priority over how the pie is divided up. That is likely to happen if the academics are very incentivised. So it is helping them and maybe there is an easy way in which they can get advice, because at that stage it is often the academics seeking advice on how to get the best deal out of their university, and it is not an evenly balanced set of scales in terms of experience when they enter those negotiations.

Q250 **Dr Tania Mathias:** Do you think the small business research initiative could be developed better to help?

Professor Dowling: Yes, absolutely. It is a huge opportunity to use Government procurement to help SMEs. I think we probably could do



with champions for it, but champions particularly within Departments or maybe even a cross-Department ministerial champion. It can always look slightly high risk for Government procurement to go for a smaller business. We also think it is an opportunity to join up academics with small companies around a new product, and maybe for even those who are unsuccessful in procurement there could be a partnering or a matchmaking deal done among unsuccessful bidders to help them develop their products more successfully.

Of course, the NHS is another major procurer. For the UK, it is a fantastic opportunity to have influence on such a major health provider and it can be used positively to pull some of our leading-edge research and innovation results through into practice.

Q251 **Jim Dowd:** Could I look at UK Research and Innovation for a moment and its role in this? A priority that the Government have given it is to improve the business-university link. What steps do you think would need to be taken for it to achieve that?

Professor Dowling: We have already touched a bit on hiding the wiring, but making sure that there is no wrong door for a business-university research collaboration across the whole of UKRI would be very helpful. At the moment it is almost necessary to decide whether a particular project should go in for funding in a particular research council call, sector or discipline, or to Innovate UK. If that could be made seamless so that, no matter how the approach was made, it got sent or was directed to where the greatest chance of a fair hearing or a fair project appraisal would be done, that would be important. So no wrong door for business-university research collaboration would be fantastic.

Another element of being simple would be to make sure that some of the very valuable funding schemes that enable early or first partnerships between a business and a university have a common framework across all the research councils. A very popular one is CASE awards—collaborative awards in science and engineering. They are modest funding. They fund a single PhD student with some money from the business and much from the research council. A key part of that is that it is a very flexible kind of funding. To have common arrangements for that across all the research councils, again, would be a great simplification. So, I would say simplification of the interface.

But another area is to be able to move up and down the technology readiness levels easily. Currently, you have the research councils acting on very early-stage ideas. Innovate UK is in the middle range. But life is not like that. When you work on a project at TRL levels 3, 4 and 5, you find that there are some fundamental things you do not understand, and that means going back to fundamentals. To be able to move seamlessly up and down the technology readiness level, picking funding from where it is appropriate, will help to go from early-stage research, which we are very good at, through to the next stage, which is where you are getting it ready, not absolutely to commercialise, but looking at how you go from a



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laboratory idea to something that is directed more towards an application or to a use; it would or could enable that seamless transition. Too often the ideas from the research councils have to start again, almost, getting a different source of funding to go up to the next stage in application.

Then, as I was saying earlier, things that are at a use-inspired end will often spin out fundamental questions and you would like to be able easily to join up funding for that. That would be really helpful.

I suppose the final thing is that we will only really be able to work across the research and innovation platform as well as we could if we have the skilled people, and UKRI also needs to address the skills challenge that we have in science and engineering.

Professor McMillan: Building on the two aspects, it is important that UKRI does not get hung up on the mechanics and the wiring, and just concentrates on that. It is also important that it does not get hung up on a very linear model of how these things work. This is not about Professor X inventing something over here and then going all the way through.

That does happen, and clearly we need a mechanism to help that happen, but it is about building relationships. It is about the people, having that flexibility and encouraging interactions. With Innovate UK under the same roof as the research councils, it would be a mistake if they were at two ends of a corridor and do not speak to each other. It really is a new opportunity to bring those two things seamlessly together and think about the people, whether it is educating students or academics, or indeed industry and bringing more industry in. We have to try to move away almost from the idea of technology transfer and talk more about co-generation much more. Again, that is not the only solution, but the bias has to shift in that direction, and that will help both industry and universities in all sorts of different ways.

Q252 **Jim Dowd:** Sure; that is pretty comprehensive. Some concern has been expressed that UKRI will displace Innovate UK's commercial focus. Is that inevitable, do you think, or is it a good thing even?

Professor Dowling: It is essential that that does not happen. There has been talk about having an industry representative on the board of UKRI. I think that is excellent, but it is not sufficient. The business focus needs to be at all levels within UKRI, but, in regard to Innovate UK in particular, its customers are business and there needs to be no barrier toward that engagement.

Professor McMillan: The business leadership and interface absolutely needs to stay. It should not be just the commercialisation arm of the research councils.

Professor Dowling: That is a good thing to do; it is necessary but not sufficient.

Q253 **Jim Dowd:** The Government recently said that Innovate UK will not



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become just the commercialisation arm of the research councils; so at least that is a common objective. Whether it is an achievement or not remains to be seen.

Finally, we put a question to the earlier panel on the industrial strategy challenge fund, because UKRI will be responsible for this. How do we ensure that as much of it—if not all of it—is spent on UK research rather than going elsewhere and supporting programmes elsewhere?

Professor Dowling: I am sorry; I missed the last few words.

Q254 **Jim Dowd:** How do we ensure that it is spent on research in the UK rather than going elsewhere and supporting programmes elsewhere?

Professor McMillan: More broadly, if the emphasis is on the partnerships, you can start influencing the geography by deciding on your partnerships. On the other hand, we should not be too inward-looking, and if the right partnership, to be honest, for a company is with an overseas university or for a university with an overseas commercial partner, that should not be totally out of the question. But the majority can be dictated by the geography. Again, that challenge fund has to get the right balance between supporting the business that we have today, because there is a bit of that that needs doing, but it also needs to have an eye on the real opportunities in the businesses of the future. Again, that is going to come at that interface. With regard to everything we have said almost about UKRI, the challenge funds could be focused on making some of those things happen.

Professor Dowling: I agree with that. The challenge fund is a huge opportunity. Research and innovation is quite a global activity, but we are so good at the research base that it can be used and is used as a hook to bring overseas countries to establish, first of all, R and D, but then subsequently other activities in the UK. We need to make sure that it works in a way that enables growth in the UK, and do that with partners that best enable that.

It means looking to see where we have research strength but also where we are able to commercialise. Commercialisation can be in the form of new companies. Those spin-outs grow very rapidly, and it is certainly a very valid way. But, also, we must not forget the opportunity of working with the major companies that we have, and in the industrial strategy doing it in such a way that they are encouraged to work with and grow their supply chain in the UK, and encourage their supply chain to innovate as well. A successful strategy needs to take all that into account.

Q255 **Victoria Borwick:** Professor McMillan, your report identified university leadership as playing an important part in making technology transfer a success. How can university leaders help foster a culture where technology transfer is encouraged and successful?



Professor McMillan: There is a whole range of different things. There is that overall culture; the leadership needs to come from the top. It relates to some things you have talked about in the previous session around the profile not just of the technology transfer offices but the context that they are in and knowledge exchange more broadly. Having only been a vice-chancellor for 16 months, my senior team has the person who is responsible for this whole area sitting there with us as part of our senior team.

Again, we talked a lot in my report about clarity of purpose and clarity of strengths, where we think our particular strengths are, and how we are going to play to those. We talked about clarity for our academics in what the university might expect from them and what they might expect from the university, whether it be in specific reward connected to commercialisation aspects, on the one hand, or in terms of the whole issue of valuing technology transfer knowledge exchange as an activity, which then feeds into promotion exercises and all those sorts of things. Many of our academics are more concerned about the rewards they get through those sorts of promotional things than they are about money, and we have to recognise a lot of those things.

Q256 **Victoria Borwick:** While we are talking about that, I recently chaired a session on the emphasis on publications, how universities are graded and the current set-up on that. It was an absolute eye-opener to me how that is focused on the requirement to publish, who owns the research that has been published and so forth. With that emphasis, do academics have time and capacity also to focus on the commercialisation and the potential for the university as a whole rather than their individual score, so to speak?

Professor McMillan: I think it is fair to say that not all academics have the time all the time, and that, again, is where the leadership comes in, in using the workforce in a way that does it appropriately. It is not just about research. We are in the middle of writing our teaching excellence framework returns at the moment. We want them to do some teaching as well.

Q257 **Victoria Borwick:** I was just about to come on to that, because surely the other point has been that everyone is paying for their university and they are suddenly saying, "Gracious me, what are we actually paying for? If all these people are out writing papers or they are out doing commercialisation of different projects, where is the student's education fitting into that?"

Professor McMillan: The student education bit specifically on this area is an interesting topic, and Tim Dafforn is doing some work on that within BEIS at the moment. It is very interesting. It is highly unlikely, as was said in the previous session, that every student in every university will get a course on IP. We have to be honest about that.

On the other hand, what is a good number? Tim's current evidence, which is probably an underestimate, is that about 4% of students get



some sort of formal instruction in enterprise/entrepreneurship. I was with him last week and I said, "So what should that number be? If 4% is small, should it be 5% or 6%?" It certainly should not be more than 20%, because that would probably be a waste of everybody's time and you would not get that interest. Nevertheless, universities need to provide that opportunity for students to take if it is appropriate for them, whether it is their subject or their interests.

Q258 Victoria Borwick: I am fascinated. The student arrives, and where is their opportunity to be involved with some other research, let alone taking that through to commercialisation, because that in the end may affect their job prospects for life? One thing we are very interested in as a Committee is skills, technology and transfer in the future.

Professor McMillan: Indeed, and different universities take different models. Some have very much an enterprise theme that every student can at least have access to. Some have very specialist schemes within it. Increasingly, I think, universities are going back almost to not necessarily the full old sandwich degree-type model but certainly trying to make sure that students have work placements. There is a lot of interest in internships, and again those internships are an important part of the relationship building that fits into the other side of the equation that we have talked about, ultimately through to CASE studentships and KTPs through Innovate UK and all those sorts of things.

That whole landscape really has to be taken into account, and that includes the finances. Partly going back to a previous point, universities need to have some money out of a system of commercialisation. If that money does not come out of that process, where is the money coming from? Universities do not have that broad a range of income streams, and it would not necessarily be appropriate to spend student fees on that.

Victoria Borwick: No.

Professor McMillan: Research fundamentally in this country is underfunded by 20%, 30% or 40%, depending on how you measure it. There is not a lot of slack in that system. When thinking about the financial aspects of all parts of technology transfer and knowledge exchange, that whole environment needs to be taken into account.

Q259 Victoria Borwick: On the point that the majority of technology transfer is concentrated in only a handful of universities, do more universities need to become actively involved in the commercialisation? How would you address that?

Professor McMillan: It would be unwise to say that every university has to build up and have a technology transfer office with 10 people in it. That might not be appropriate for the particular university with a particular portfolio, a particular sector spread, and the particular region it is in. All universities should be able to have mechanisms by which they can enter the game if they need to, whether it be calling on other expertise outside their university if needed.



Q260 **Victoria Borwick:** Finally, there seems to be limited support available to technology transfer staff to help them access opportunities for commercialisation. Is that because it is restricted to a few? How could you expand the offer or the opportunities to take part?

Professor McMillan: One thing that I have learned over the last year or so while doing this review is the value in that sort of regard of an organisation called PraxisUnico, which is around technology transfer. It is relatively new. They are trying very hard to provide that national network. They have a very strong national annual meeting that I went to this year, where there is that strong sense of learning. They provide a lot of online support, facilities and information for their members in order to try to spread best practice all the time. They run courses and have a very international flavour as well. They have responded very well, for example, to our report and are very keen to look into how they can make a lot of these things happen and implement some of our recommendations.

Professor Dowling: Could I comment on one element of that when you asked about incentives for academics? In my review we found many academics felt that they worked with business in spite of their university rather than encouraged by it. One thing that really has made a difference is the inclusion of impact in the REF. In one of the round tables, one of the academics said that in his career he had been working with business—and the inclusion of impact in the REF—was the best thing that had ever happened, because now, suddenly, universities at a senior level are interested in having some high-level case studies illustrating real impact on business in a way that perhaps it did not have that high visibility before.

Victoria Borwick: That is excellent; that is very reassuring. Thank you very much.

Q261 **Chair:** Can I just pick up on that point? Your report said that the REF had acted as a barrier, I think, to academics moving between universities and businesses. But then you have said that the impact agenda has changed that emphasis. Could you clarify that for us?

Professor Dowling: The REF measures various things. The highest score goes on publications, and so there has been a real pressure on academics to produce high-level publications. Part of that has been that, when new academics are recruited, quite often universities were looking for someone with a track record of publications, and so that tended to be a barrier to recruiting someone in business. Even if they had been doing some excellent research, business does not tend to want to publish its results, and so they would not have that publication record. It could also be a deterrent for academics. There are some excellent schemes where they spend some time working in companies, and again the REF can be a deterrent to that.



The changes being proposed in the Stern review are that there would be a reduced number of publications to be submitted by a researcher, but there would also be flexibility about the authorship of those. An average of two per researcher is proposed but it does not have to be two from each person. That gives some flexibility if universities choose to use it in that way. It would be good for the REF to be very clear that mobility is something that would be encouraged by this kind of flexibility. Impact is good in the REF.

We were also suggesting in my review, in assessing the environment where wider networks are considered, that, in regard to having mobility of people between business and universities, universities ought to have the opportunity to communicate their successes in the environment section of the REF.

Q262 **Chair:** That prompts two further questions. First, do you think Lord Stern's review goes far enough or do you think it is a step in the right direction? Is there more that could be done? The second is around the benefits of moving between industry and university, and perhaps you would say why it is so important that academics do that.

Professor Dowling: There are two elements. Lord Stern's review has given a good framework. Underneath it now there is another level of detail to be put in, and the things that I am talking about can be done at that next level down. Now it is up to HEFCE and the other funding agencies to put more flesh on the way they would respond to Lord Stern's review.

With regard to mobility and the idea of how you go from research into commercialisation, and joint working with businesses and universities, these are not things that you can learn at a distance. They are contact sports. You have to get to know people. They are all built on personal relationships. It is building a network of people who trust one another, because that is what is at the heart of it, and that only comes with knowing and being able to appreciate what the other side's aspirations and constraints are. That really is done by bringing people together. That mobility is a way of achieving that.

Q263 **Chair:** Finally on this point, before I pass back to Victoria Borwick, are some sectors better at this than others?

Professor Dowling: I come from engineering. At the heart of engineering, of course, we are interested in application, so it is very natural in engineering to work across that interface. But I also see it working really well across the medical interface as well, in life sciences and medicine. By its nature again, universities are joined up with deliverers or practitioners in those areas.

Professor McMillan: Not to forget even the more general interfaces, for example, in management schools or business schools. My own university has just introduced professors of practice. We are not the first to



introduce them. They are a good way for people to come from business into the university. It works both ways. If we get on to talking about SMEs, it is as much about educating them, letting people develop and have their own ideas and push on, rather than always just about giving them the mechanics that they need now.

Q264 **Chair:** Briefly then, we heard in the last panel Mark Anderson talk about an IP course for students. Would you think that would be a good recommendation?

Professor McMillan: As I say, possibly not specifically IP, but IP as part of an enterprise/entrepreneurship theme would be an appropriate thing to do.

Q265 **Victoria Borwick:** While you are on your report, if I may quote you or possibly misquote you, there is relatively little discussion in the UK about the spatial dimensions to technology transfer. Obviously, we all have debates about how we can replicate Silicon Valley. Can you clarify what type of evidence you think is currently lacking in order that we can move forward?

Professor McMillan: With regard to the spatial elements, what is missing? Some of the science and innovation audits are going to fill some of that gap as to where some of that information is coming from. I have a slight personal concern that some of that is a little backward-looking rather than forward-looking, and the next stage has to be to take those audits and push hard on where to go next.

Some parts of the country are in a different situation from others. I am in the midlands, and we are pretty much in the middle of things. I have seen a map recently of the number of people involved in industry in R and D in different parts of the country, and it stands out very clearly, for example, that the north-east has a very big problem. The number of people working in industry in R and D up there is very small. That, inevitably, will have an impact on what the universities up there will do, and do appropriately, within their schemes.

Q266 **Victoria Borwick:** I wish some of our more northern Members were with us today. I am sure they would have asked more detailed questions. It is not my area of expertise. Taking you back, you have previously noted that the impact of local enterprise partnerships on the regional innovation landscape had been highly variable, which rather follows through what the professor was saying. How could the LEPs better support the business-university collaboration?

Professor Dowling: It is the importance of being able to co-ordinate across LEPs so that they are working collaboratively rather than in competition. Of course, the regional growth partnerships are a way of achieving that. Coming out of the science and innovation audits, it is not simply looking to see what a local area can do. We need—maybe Innovate UK is the right body—to help them co-ordinate other areas that have similar strengths rather than setting up a regional competition—



Q267 **Victoria Borwick:** How could that happen?

Professor Dowling: Probably Innovate UK should try to help develop a national landscape and make sure that they are providing links. What we really cannot afford to do as a country is set off lots of local competition. We have to try to join up areas that have highlighted particular technology disciplines as something they want to focus on.

Q268 **Victoria Borwick:** Something that we have touched on before is that there do not seem to be very many examples of the technology transfer offices formally collaborating on a regional basis. What is driving the UK institutions' specific output rather than a regional approach to technology transfer? Is it just pride—

Professor McMillan: As to a driver, something we picked up in my review that probably needs more work is to look at international models to see where some of groupings have been tried. The details become a little bit hazy. My understanding is that France has tried to centralise some of that support and then backed off a little bit. I think California did the same thing. They had a University of California system and now each of the nodes has started to retrench back. I know in Queensland in Australia they tried something similar.

Again, I think it comes back to this contact sport thing. What you need is people on a daily basis wandering around, talking to the academics, getting them into the right mindset and then picking up on the ideas and gems when they appear. It cannot be planned. You cannot regulate it. You have to have that environment where it is there as part of the culture and the environment rather than just something you go to when you know you want it, because you might never know that you want it

Q269 **Victoria Borwick:** Keep those ideas coming, because we can certainly relay them to the right people. Thank you.

Chair: Thank you. Finally, Derek Thomas.

Q270 **Derek Thomas:** My understanding is that, nationally, we currently do not collect information on technology transfer that can be broken down into a technology sector. How straightforward would it be to collect this data and how would that help universities to shape their IP strategies? Is that a complicated question?

Professor Dowling: I think that is more for you than for me.

Professor McMillan: Thank you.

Derek Thomas: Well delegated.

Professor McMillan: It is true that it is hard to break things down by sector. It is not impossible. There are reports and there is probably an analysis that could be done in terms of the sophistication of information certainly from a university perspective that we put into HEFCE in relation to our general engagement performance, which then translates into our funding for HEIF. There may well be a mechanism there, and I am sure



HEFCE could look at that. For most universities, the numbers would possibly be too small to have a huge significance in setting the direction. It would probably need to be a national-level analysis rather than anything that would help very much at a local level.

Professor Dowling: If there was more flexibility between the university that did the innovation and where it got exploited, then you could have a situation where particular technology transfer—it could well be in a university but what one sees in the US is other bodies are involved in this technology transfer—gets a reputation for a particular expertise in biomedical or IT. One would get more of a collection of national hubs for doing technology transfer. I think that makes a lot of sense. Rather than have every university trying to cover every single sector, one had flexibility to go to the university that had the biggest and most developed links with venture capitalist willing to invest in that area and had particular expertise. Developing a bit more of an open market could be beneficial and then it would certainly help gather those statistics or at least have hubs that had a big repository of technologies in particular.

Q271 **Derek Thomas:** That makes a lot of sense. We are cautioned against using the number of spin-outs or patents registered as measures of success, and obviously we are all keen to look for success. What metrics could be applied to assess the quality and depth of relationships between universities and business? Is there a way of seeing how successful it is—

Professor Dowling: There are different elements. If we stick with the spin-outs first, the number of jobs created is a measure of what the spin-outs achieved rather than just the fact that they happened. How many jobs did they create? How much substantial VC did they attract? Those are real measures of success in setting up companies.

As to business-university research collaborations more generally, things such as repeat business are a real sign of success, and long-term partnerships and what those collaborations have achieved. Every time you mention a metric, it could be manipulated, but genuine interactions and transfer of people would be another element. Those people might be industrialists giving courses or spending time in the university. It could be academics spending some time in the company. But, more than ever, it would be some graduates, whether they are postdoctoral after a PhD or after a first degree, going into the companies and that being facilitated by the collaborations.

Professor McMillan: I am not sure I have any great answer except to say that it has to involve something around the quality of interactions, as Dame Ann said, rather than just a number of spin-outs. We could all produce hundreds every year, which would be totally meaningless and would just disappear. There is something around that longevity, that quality, that needs to be brought into the equation. It is not easy. It is easy to say and less easy to pinpoint what you are measuring because the danger is not just that it would be manipulated but that it will start to



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produce perverse behaviours within our institutions, and again that becomes a distraction as much as anything else.

Professor Dowling: But if it encouraged more jobs that is a great kind of behaviour to have.

Q272 **Chair:** Thank you very much, Dame Ann and Professor McMillan. Again, I am sure you will look forward to hearing us put some of these points to the Minister on 11 January. Before then, we look forward to reading the Government's response to your report.

Professor Dowling: Me too.

Chair: Yes, I am sure. Thank you both very much for joining us.