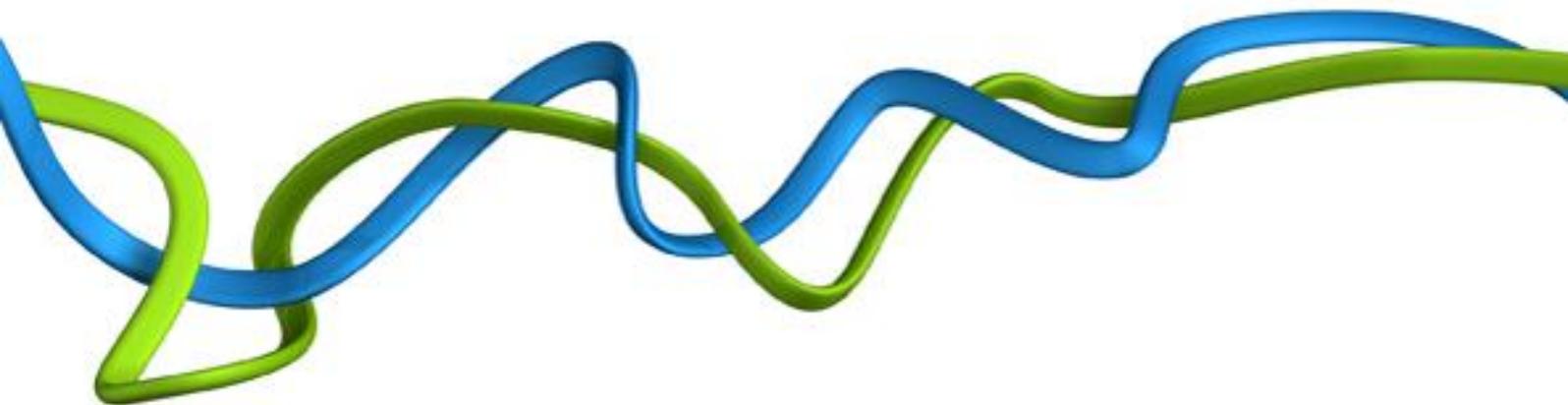


Managing intellectual property and technology transfer

House of Commons Science and Technology Committee

Submission from the Royal Academy of Engineering

15 September 2016



About the Royal Academy of Engineering

As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.

Managing intellectual property and technology transfer

House of Commons Science and Technology

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Summary

- Evidence collected from the Academy's Enterprise Fellows - exceptional academic entrepreneurs who have recently spun out a company - demonstrates that there is considerable variation in the approach to research commercialisation in UK universities. While the UK clearly has many strengths in research commercialisation, the overall perception in the UK engineering community is that there is still room for improvement.
- The Academy believes that universities have a valuable role to play by nurturing and supporting those with entrepreneurial talent and contributing to the ambition to make the UK the best place in the world to start and grow a business. As part of their mission to deliver impact for society, including the economy, universities should ensure that the primary objective of their approach to research commercialisation is the exploitation of intellectual property (IP), not just its protection.
- The allocation of equity during the formation of spin outs is a complex and contentious issue. The Academy believes the ultimate aim for all parties involved should be to grow a successful business. The division of equity should incentivise exceptional academic founders to drive the company forward and the amount and quality of support provided by the university should be reflected in the stakes it seeks. Consideration should be given to building up an evidence base on the benefits and feasibility of anti-dilution provisions.
- The talent and skill level of technology transfer office (TTO) staff has a direct bearing on the quality of research commercialisation. Budget restraints may be preventing TTOs from recruiting and retaining talented staff with necessary prior business experience, and commercial and sectoral awareness.
- A lack of understanding by the academic entrepreneur of the spin out process and of the different perspectives of stakeholders contributes to difficulties encountered in the spin out process and puts academic founders at a disadvantage when entering negotiations. Levelling the information asymmetry between the academic entrepreneurs and the university should result in an improvement in the spin out process for all parties involved.

1. Introduction

- 1.1. The Royal Academy of Engineering welcomes the opportunity to submit evidence to the House of Commons Science and Technology Committee inquiry into managing intellectual property and technology transfer. The Academy has current experience of practices around spinning out through its Enterprise Hub and highly relevant expertise within its Fellowship, including serial entrepreneurs and investors.
- 1.2. The Academy's Enterprise Hub, founded in 2013, is a national resource for the UK's most promising engineering entrepreneurs. The Hub forms part of the Academy's commitment to stimulate excellence and promote creativity and innovation in engineering. The Hub does this by making awards to exemplars of excellence in innovation in engineering, who will be the founders and leaders of tomorrow's high-tech companies. The Enterprise Fellowships support outstanding entrepreneurial engineers, studying or working at a UK university, to prove the utility of an innovation by spinning out a business based on that innovation. The Hub provides the host university with up to £35,000 in salary support for the Enterprise Fellow and an additional £25,000 grant for continued development of the innovation and associated spin out company.¹ In addition, the Enterprise Fellow becomes a member of the Enterprise Hub where they receive an intensive bespoke package of training and mentoring, and access to the Hub's network.
- 1.3. To date the Academy has awarded 49 Enterprise Fellowships to exceptional academic entrepreneurs hosted by 21 different universities. During the course of managing the Enterprise Fellowships the Academy has become aware of the widespread variation in the approaches to spinning out adopted by different universities, as well as the numerous and diverse challenges faced by the Enterprise Fellows. To capture a snapshot of how engineering research is currently commercialised via spin outs with academic founders in UK universities the Academy has collected details of the experiences of its Enterprise Fellows, including through interviews and a survey; the findings have been used to inform this submission. Although the Academy's sample size is relatively small the collective experiences of the Enterprise Fellows nevertheless provide a valuable insight into the academic founder's perspective of the spin out process.²
- 1.4. The Academy recognises that productive discussions regarding research commercialisation practices require the perspectives of different stakeholders to be heard and that the perspectives of these stakeholders often differ. Although the perspectives of academic entrepreneurs should not take precedence over the views of other key stakeholders, there are concerns that the voice of academic entrepreneurs has not been sufficiently represented in recent literature and debate on research commercialisation. The Academy also recognises that academics may sometimes be ill-equipped to manage a spin out company and all that the spinning out process entails. However, the experience of the Academy's Enterprise Fellowship scheme shows that this is not always the case. This submission is informed by the experiences of those exceptional and excellent academic entrepreneurs who have the potential to succeed.

¹ From August 2016 the Academy offers two levels of Enterprise Fellowship: £60,000 for post-doctoral academics wishing to spin-out from a university; £50,000 for recent graduates wishing to establish a start-up without any formal involvement of a university.

² The Academy's Enterprise Fellowships focus on engineering and technology, but the academics come from different branches of science and engineering technology, for example nearly a third of Enterprise Fellows are from the biomedical field.

2. How the respective roles of universities and TTOs in commercialising research have developed over the last decade;

2.1. Universities have rightly become more aware of the importance of intellectual property generated by their research and have significantly professionalised their knowledge exchange activities over the past decade.³ Although elements within the UK TTO system demonstrate world-leading practice,⁴ the overall perception in the UK engineering community, both academic and business, is that there is still considerable room for improvement. In parallel, the last decade has also seen rapid maturation of the wider start up ecosystem in the UK, specifically support for high-tech companies with the potential for fast growth.⁵

2.2. In 2014/15 UK Higher Education Institutions (HEIs) achieved an income of £155 million from IP, of which just over a third came from sales of shares in spin-offs at £53 million, £14 million from licensing to SMEs and £75 million from licensing to large businesses.⁶ However, HEI income from both collaborative research and contract research dwarfs that generated from IP, at £1.3 billion and £1.2 billion respectively.⁷

2.3. The inclusion of impact in the 2014 Research Excellence Framework (REF) has been broadly welcomed as a means of stimulating universities to articulate and ultimately improve the translation of their research into social, environmental and economic benefits. Working with business provides an important mechanism for achieving impact and there are indications that the assessment of impact has catalysed a shift in the attention given by universities and academics to this aspect of their work.⁸ Numerous impact case studies, submitted as part of the REF, quantified the substantial benefits derived by companies from university research that have led to the development of profitable new products and services. The Academy welcomes Lord Stern's recommendation that impact should be retained in the next iteration of the REF.⁹ The retention of impact will act as a catalyst to drive further improvement in research commercialisation and increase recognition of academics who have engaged in excellent translational and collaborative activities.

2.4. The challenges associated with research commercialisation, especially the formation of spin outs, have come under increased scrutiny in recent years.¹⁰ The Academy is pleased to be participating in these discussions and agrees with the recently published McMillan group's, *University Knowledge Exchange (KE) Framework: good practice in technology transfer* that it is important that the UK continues to be aspirational in its technology transfer practice.¹¹

³ [The Dowling Review of Business-University Research Collaborations](#), 2015

⁴ [Commission Recommendation on the management of IP in knowledge transfer activities and Code of Practice for universities and other public research organisations](#), European Commission Research Policy, 2008; [Creating university-based entrepreneurial ecosystems, evidence from emerging world leaders](#), Dr Ruth Graham, 2014

⁵ The Global Startup Ecosystem Ranking 2015, Compass, 2015

⁶ [Higher Education – Business and Community Interaction survey](#) 2014-15, 2016

⁷ [Higher Education – Business and Community Interaction survey](#) 2014-15, 2016

⁸ [The Dowling Review of Business-University Research Collaborations](#), 2015

⁹ [Building on Success and Learning from Experience](#), An Independent Review of the Research Excellence Framework, 2016

¹⁰ [Keys to the Kingdom](#), Nature Biotechnology, Wong et al., 2015; [UK Technology Transfer: behind the headlines](#), 2015; [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

¹¹ [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

3. How well universities and TTOs balance objectives of protecting IP and encouraging public-benefit research, and whether TTOs' and universities' IP strategies effectively deliver such objectives in practice.

- 3.1. Universities engage in technology transfer as part of their mission to deliver impact for society, including the economy.¹² To deliver impact, universities' strategies and actions must go beyond the objective of protecting IP to prioritising the exploitation of that IP through research commercialisation. The Academy believes that universities have a valuable role to play by nurturing and supporting those with entrepreneurial talent and contributing to the ambition to make the UK the best place in the world to start and grow a business.
- 3.2. Given the broad spectrum of universities in the UK, each with their own mission and in a wide range of ecosystems, it is no surprise that there are differences in universities' research commercialisation strategies. However, it has been suggested that factors which directly impact those tasked with implementing a university's research commercialisation strategy, such as resourcing, staffing, priorities and targets, may have a greater influence on the way research commercialisation is conducted in universities than top-down strategies set at the senior management level. It is important that differences in universities' research commercialisation strategies should not be used to mask less than optimal research commercialisation practice.
- 3.3. The experience of the Academy suggests that universities are most likely to succeed in exploiting IP and delivering impact through spinning out companies and licensing when the primary objectives of all the parties involved are aligned with the aim of making a success of the opportunity. However, it appears that all too frequently the objectives of all the parties do not align. There is a perception that a university's objective to maximise returns from research commercialisation can take precedence over the objective of growing a successful business. However, such tensions are perhaps unsurprising if TTOs are expected to generate significant income.
- 3.4. As stated in the Dowling Review of Business-University Research Collaborations, the approach to funding and measurement reflects institutional expectations of TTO activities.¹³ Asking TTOs to generate income to ensure their survival or measuring their success as a function of near-term income generation engenders a belief that their primary function is income generation rather than supporting the delivery of long-term benefits from research.¹⁴ For universities to 'consider their IPR strategies as part of their research strategy rather than earned income strategy', as recommended by the UK's IPO,¹⁵ TTOs will require long-term financial security.
- 3.5. There are sources of funding such as the Higher Education Innovation Fund (HEIF) and the indirect costs component of 'full economic costs', which can be used to support the costs of TTOs. The Academy welcomes government's recognition of the importance of HEIF and calls for a long-term commitment to maintaining this much valued funding mechanism. Universities should consider whether their model of TTO funding and resource level aligns with the role they want their TTO to fulfil. In considering resource levels for TTOs, universities should take into account the significant roles TTOs have

¹² [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

¹³ [The Dowling Review of Business-University Research Collaborations](#), 2015

¹⁴ [The Dowling Review of Business-University Research Collaborations](#), 2015

¹⁵ Intellectual asset management for universities, IPO, 2013

played in generating impact case studies in the REF, which underpinned the allocation of quality related research (QR) funding.

- 3.6. There is a perception that some universities may view licensing IP to an established company as a cheaper, lower risk and lower 'hassle' option than setting up a spin out. Licensing IP to established businesses typically yields greater income than sales from shares in spin outs for UK HEIs (see paragraph 2.2). However, the Academy believes that identifying the most appropriate route to market with the optimum chance of success should always be the starting point when considering how to approach research commercialisation. This approach is employed by the more progressive UK TTOs.¹⁶ Furthermore, supporting the creation of spin outs is necessary to fulfil the UK's ambition of creating more innovative small companies with the potential to grow to scale.
- 3.7. It is perceived that there is a lack of clarity in high-level messages from government and public funders about how universities should approach and prioritise knowledge exchange and technology transfer.¹⁷ It is not always clear if universities have clarity on how they wish their institution to balance earning income from IP with their role of advancing knowledge and facilitating its exploitation for the public good. Such lack of clarity is likely to impact both on the behaviours of the TTO staff and the quality of the relationship they develop with academic entrepreneurs and businesses partners. The Academy welcomes the recommendation in the McMillan group's report to invite university leadership to submit a statement on their governance arrangements on IP, and to give clarity on research commercialisation policies and practice, and approaches to maximising benefits to society.¹⁸

4. Any scope for individual universities/TTOs to adopt particular good practices and IP strategies from others:

Spin out support

- 4.1. Different universities provide differing levels of support for their research commercialisation activities. These differences have impacted on the experiences of the Academy's Enterprise Fellows, with some receiving support in the form of initial market research, submitting patent applications, and business advice, and others receiving very little support beyond securing a patent. Given that universities have differing missions, characteristics and circumstances this disparity in the extent of support for spin outs is not unexpected. However, these differences do not fully account for the differences observed in the quality of support given to spin outs. The Academy believes these differential levels of support should be reflected in the return sought by the university in the formation of the spin out.
- 4.2. Differences in support offered to spin outs are in part a response to the extent, or lack, of externally available support - the 'entrepreneurial ecosystem'. MIT and Stanford are often held up as examples of best practice in the formation of spin out companies, in part due to the relatively small equity stake they request (equity stakes are further discussed in paragraphs 5.5-5.9). However, it is argued that MIT and Stanford are

¹⁶ [Spin-out versus Licence](#), Tom Hockaday, 2014

¹⁷ Streamlining university/business collaborative research negotiations: an independent report to the Funders' Forum of the Department for Innovation, Universities and Skills, The Saraga Review, 2007 and Dowling

¹⁸ [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

exceptions at research commercialisation, even within the US, largely due to the existence of entrepreneurial ecosystems located around the universities, from which academic entrepreneurs can draw resources and business support.¹⁹ This topic is returned to in paragraphs 7.2.

Resourcing of TTOs

- 4.3. TTO staff play a critical role in the process of research commercialisation, having to undertake a number of specific and expert tasks including, but not limited to, IP valuation, IP protection, licence negotiation and market assessment. Consequently, the experience and skill level of TTO staff has a direct bearing on the quality of research commercialisation. Although it is probable that TTO staff may be unduly singled out for criticism, in part due to their role in managing risks and conflicts of interests,²⁰ there are long-standing concerns that the variable quality of TTOs and their staff can be a barrier to successful commercialisation of university IP.²¹
- 4.4. In particular, the Academy has heard concerns about a lack of commercial and sectoral awareness and prior business experience of TTO staff. Recent research supports these concerns, suggesting that there are limited materials that provide comprehensive guidance on approaches to market assessment and opportunity evaluation, thus influencing the ability of staff to undertake these tasks effectively.²² These concerns may be further exacerbated by TTO staff's lack of authority, issues of understaffing and high levels of staff turnover resulting in delays and loss of knowledge. University salary structures, as well as TTO budget restraints, may mean universities are unable to recruit and retain top-flight staff due to the inability to offer competitive compensation packages to individuals with better opportunities in the private sector.²³ The Academy has also received very positive feedback about some TTOs and their staff; these individuals could serve as role models and advisors to developing TTOs.
- 4.5. The UK benefits from the work undertaken by PraxisUnico, the national professional association for public sector knowledge exchange and commercialisation practitioners, which delivers training to TTOs and others involved in technology transfer, and facilitates sharing of best practice. The Academy welcomes the recommendation from the recently published *University Knowledge Exchange (KE) Framework: good practice in technology transfer*, that PraxisUnico explore ways to help less experienced or smaller scale technology transfer units to develop appropriately and to see if more could be done to identify and implement good practice differentiated by specific technology sectors.²⁴ The Academy is fully committed to working with all relevant stakeholders, including PraxisUnico, to continue to support the creation of products and services of value from the UK's world-leading research base.
- 4.6. The Academy has frequently heard concerns that the time taken to spin out a company or secure a licensing deal is excessively long, especially when compared to the corporate sector. In a survey conducted by the Academy, all but one of the Enterprise Fellows who specified the time taken to reach agreement on spinning out and equity splits indicated that it had taken six months or longer, with some negotiations

¹⁹ [Are US university spin-out processes really better than those of UK universities?](#) Lita Nelson and Katherine Ku, 2016

²⁰ [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

²¹ Lambert Review on Business-University Collaborations, Richard Lambert, 2003

²² [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

²³ [The Impact and Effectiveness of Support Measures for Exploiting Intellectual Property](#), Nesta Working Paper No. 12/03, Rigby and Ramlogan, 2012

²⁴ [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

continuing for a year or more. Similarly, the time taken to agree negotiations was a feature of the most frequently cited barrier to collaboration for businesses and the second most frequently cited barrier for universities in the Dowling Review.²⁵ Although complex negotiations involving multiple partners are unlikely to be quick to resolve it appears that issues around resourcing of TTOs may be unduly delaying progress, including in dealing with simple requests. TTOs are familiar with this criticism and acknowledge that the work burden and level of experience of staff are contributing factors.²⁶ There is also a perception that discussions about equity significantly contribute to the time taken to conclude negotiations (equity stakes are further discussed in paragraphs 5.5-5.9).

4.7. Greater pooling of skills, sector knowledge and technical expertise may improve universities' support for research commercialisation and result in more efficient use of public funds.²⁷ There are already examples of universities and TTOs working in collaboration as well as mechanisms for informal sharing of expertise by TTO staff. For example, the SETsquared Partnership is an enterprise collaboration between five research-intensive universities: Bath, Bristol, Exeter, Southampton and Surrey. The partnership facilitates sharing of best practice as well as implementing schemes and programmes to assist research commercialisation. Creating a critical mass of IP may help to build an entrepreneurial ecosystem and be more attractive to talented technology transfer staff and to investors. Wider adoption of successful approaches could both help the performance of individual institutions and deliver broader public benefits. In addition, consideration should be given to learning from the approaches taken by successful incubators and accelerators outside the university system.

Mentorship, networking and conflicts of interest

4.8. One of the most unique and valuable aspects of the Academy's Enterprise Hub is the provision of mentoring from leading engineers with first hand experience of founding, building and leading successful engineering and technology companies. The selection of the mentor is a collaborative effort and mentors offer their services on a pro bono basis. Together the mentor and mentee develop a plan to address the mentee's specific needs which will include provision for business training, technical assistance, specialised mentoring and coaching as required. The Academy mentors also form part of the Enterprise Hub's growing network. The Hub provides access to activities and opportunities aimed at connecting entrepreneurs with customers, peers, investors and other networks. Some universities are developing their own networks and mentoring schemes to support their academic entrepreneurs, with the aim of providing expert input, access to funding or access to potential customers.

4.9. To enable effective and appropriate mentorship it is essential to have a rigorous code of good practice, focussed on managing conflicts of interest. The Academy has implemented a robust policy as part of its Enterprise Hub work. For example, for the duration of the Enterprise Fellowship the Academy mentor will take no stake or interest in the venture of any kind, so they remain independent and able to offer impartial advice to both the Academy and the mentee. This means that the mentor will not

²⁵ [The Dowling Review of Business-University Research Collaborations](#), 2015. The barrier: 'IP and other contract negotiations are difficult to complete, processes difficult to navigate, or take too long' was the most frequently cited barrier to collaboration for businesses and second for universities.

²⁶ [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

²⁷ [The Dowling Review of Business-University Research Collaborations](#), 2015.

make any business decision, perform the functions of a consultant, take the role of an executive or non-executive director of the company, or invest in the company.

5. Whether funding arrangements for research commercialisation by TTOs are adequate and whether they facilitate an appropriate balance of objectives and an appropriate balance between short-term and longer-term aims;

Patient Capital investment vehicles

- 5.1. Effective and successful research commercialisation requires sufficient and appropriate (pre-)seed stage funding, which can help to fund 'proof-of-concept' activities and bridge the 'valley of death' between the development of a prototype and a product or service that is an investable proposition. There is a perception that the provision of such funds has been relatively limited in the UK historically, but that the situation has improved in recent years, especially for high-growth technology companies.²⁸ The improved funding environment can be in part attributed to the creation of investment vehicles that specialise in funding and supporting early-stage high risk companies that spin out of universities. Such funds include IP Group PLC and Imperial Innovations Group PLC and can be defined as Patient Capital investment vehicles.²⁹ Patient Capital investment vehicles specialise in long-term investment, where investors do not expect quick returns.
- 5.2. For Patient Capital investment vehicles to access a steady supply of IP in which they can invest they may establish partnerships with universities. The nature of these partnerships varies, from exclusive deals whereby the investment vehicle has the exclusive right to commercialise all IP from a university, through to non-exclusive deals whereby a university may show its deal-flow to a specific investment vehicle.³⁰ Depending on the details of the partnership with a university, a Patient Capital investment vehicle may hold a significant equity stake in a spin out in which it has not invested nor provided any clear support for. For example, it appears that the University of Bath has an arrangement with IP Group PLC, whereby IP Group receives at least a 5% equity stake in spin out companies where IP Group has not made an investment nor where it is actively involved in the opportunity.³¹
- 5.3. The attractiveness of exclusive arrangements to universities is clear, with universities having access to a ready source of investment. Establishing an evidence base to demonstrate whether such arrangements deliver best value for academic founders and the UK public purse, which funds much of the research undertaken in universities, would be worthwhile.
- 5.4. Although the increase in Patient Capital investment vehicles has created a welcome market of investors for universities to choose from, the existence of exclusive deals restricts academic founders from accessing such a market. Such restriction in the choice of initial investors for a spin out may mean a spin out misses out on investment and support that is more appropriate for their company. For example, a spin out may benefit more from an investor with specific knowledge of the market sector in which the spin out wishes to operate rather than from a generic investment vehicle.

²⁸ The Deal 2015/16; [Royal Academy of Engineering Access to Finance submission](#), 2016; [Patient Capital, A new way of funding the commercialization of early-stage UK science](#), Tony Hickson, 2016

²⁹ [Patient Capital, A new way of funding the commercialization of early-stage UK science](#), Tony Hickson, 2016

³⁰ [Patient Capital, A new way of funding the commercialization of early-stage UK science](#), Tony Hickson, 2016

³¹ www.ipgroupplc.com/media/ip-group-news/2006/2006-09-08, accessed 2 September 2016

Equity

- 5.5. It is entirely reasonable that universities seek shareholdings in spin outs in return for providing core assets, incubation services and promoting the spin out. However, determining whether the level of shareholding requested or enforced by universities is proportionate to the amount and quality of support received remains an understandably subjective and contentious part of negotiations. The amount of work and energy that is likely to be required going forward to ensure the spin out and the associated technology is commercially viable should also be taken into consideration.
- 5.6. A survey of the Academy's Enterprise Fellows showed that the initial equity stakes requested by the university ranged from 20% to 66.6%; apart from two exceptional cases where the university stake proposed was 0% (in both cases the university received licensing and/or royalties). Excluding these outlier cases, the average shareholding initially requested by the university was 46.3%.³² These figures closely reflect those identified in a recent report looking specifically at the experiences of bioentrepreneurs.³³ A number of the Enterprise Fellows attempted to negotiate with their university to decrease the universities' share and increase their own. There was a huge variation in the success of their negotiations; while some did not believe, or did not realise that negotiation was an option and therefore did not enter into negotiations at all. The share that was then subsequently held by the university in the agreement varied from 20%-50%, with an average of 36.3%.³⁴ However, in some cases the universities' initially proposed stakes were immediately diluted out by investors upon agreement to spin out.
- 5.7. The size of the stake held by the university has a bearing on the amount of equity available for the academic founder. The Academy found that the average amount of equity secured by the academic founders to share was 54%.³⁵ In all the cases there were multiple academic founders sharing this stake at various levels – from 1.5% to 80%. The average shareholding for the Enterprise Fellow, who would be the lead academic founder, was 31%.³⁶
- 5.8. There was a widespread perception from the academic founders, mentors and investors surveyed by the Academy that the equity stake initially proposed to be held by the university was out of proportion to the support provided to the development of the spin out. They also argued that granting the academic founders significant equity stakes was essential to incentivise them to drive the company forward. Evidence received by the Academy's Enterprise Hub shows that academic founders can be demotivated, frustrated and demoralised by universities (and Patient Capital investment vehicles with exclusive deals) taking what they perceive to be disproportionately high equity stakes. Furthermore, it can restrict the ability of academic founders to deploy shares as they wish, for example to reward those who have contributed to the success of the spin out. Investors, who are pivotal to the growth of the majority of spin outs, can also be put off by universities taking a large shareholding, tending to believe that founders who are incentivised by owning a significant stake are more likely to deliver value for them.

³² 19 respondents

³³ [Keys to the Kingdom](#), Nature Biotechnology, Wong et al., 2015

³⁴ 18 respondents, excluding the two 0% outliers.

³⁵ 17 responses, excluding the cases where the university did not want an initial stake and those still under negotiation

³⁶ 16 responses, excluding the cases where the university stake was 0%

5.9. It is clear that there is unlikely to be a 'one size fits all' approach, given the varying levels of support provided by the universities, the types of technologies to be commercialised and their varying levels of commercial readiness. Consideration also needs to be given to the different capability and experience levels of the academic entrepreneurs involved, and to the capacity and expertise in the local ecosystem. However, while there will clearly be valid reasons for adopting different approaches, the variation across the sector is noteworthy and should not excuse poor quality support. Further efforts to share best practice would be welcomed, particularly from those universities who understand that compromise is required to reach agreement and who work to find common ground for all parties involved.³⁷

6. Whether SMEs and larger businesses are both given an equitable access to commercialisation opportunities;

6.1. There is a perception that access to commercialisation opportunities is easier for larger businesses than SMEs. This is in part due to the characteristics of SMEs compared to larger businesses. As observed in the Dowling Review, SMEs are often focused on managing the immediate pressures of day-to-day operations, which means they may struggle to find the spare capacity to engage with universities to investigate potential licensing and collaborative opportunities.³⁸ Networking events where ideas can be presented and discussed informally, and personal links between researchers and companies can be established, can be particularly useful in this regard.

6.2. The Dowling Review also suggested that SMEs with limited experience may find the process of navigating contracts and negotiations daunting and confusing. The Academy has noted similar concerns from the Enterprise Fellows during the spin out process. Several respondents from SMEs commented on the fact that being presented with a weighty contract by a university meant that they were inclined to just walk away from the collaboration since seeking legal advice would be costly and time-consuming.³⁹ It could be extremely helpful if SMEs were able to access independent, expert advice to help them understand what to expect and how to steer a course through the process of negotiating the contract. This would not be a substitute for formal legal advice but would allow them to access personnel with experience and knowledge of the process of contract negotiation.

6.3. In contrast, larger businesses are more readily able to deploy funds and in-company expertise to progress negotiations. In addition, many universities are actively seeking strategic research partnerships with big businesses, which can provide a myriad of benefits to the participants.⁴⁰ However, there is a risk that the same amount of effort is not being used to cultivate relationships with SMEs.

³⁷ [UK Technology Transfer: behind the headlines](#), 2015

³⁸ [The Dowling Review of Business-University Research Collaborations](#), 2015

³⁹ [The Dowling Review of Business-University Research Collaborations](#), 2015

⁴⁰ [The Dowling Review of Business-University Research Collaborations](#), 2015

7. What measures universities, business leaders and government should take to assist the commercialisation process, and to reach a common understanding of how the different stakeholders involved can engage in the process.

Anti-dilution provisions

7.1. The application of anti-dilution provisions to universities' shareholdings is viewed by some in the enterprise community as a way to improve the spin out process in the UK. Anti-dilution provisions are intended to ensure that their share is protected from dilution in further rounds of investment. Anti-dilution provisions can be implemented in a number of ways, including the golden-share model which has been advocated by UK entrepreneurs and investors Dr Hermann Hauser KBE FEng FRS and Dr David Cleevely CBE FEng.⁴¹ In the golden-share model a small equity share is taken by the university, usually 1-2% is proposed, in return for anti-dilution provision, ideally legally binding, until a significant event occurs, such as an exit. If universities were prepared to take a significantly smaller equity stake than usual as they are protected from dilution, it may resolve concerns associated with universities taking large equity stakes (see paragraphs 5.5-5.9). However, the golden-share model and other anti-dilution provisions are not widely used in the UK and they remain contentious.⁴² Consideration should be given to building up an evidence base on the benefits and feasibility of anti-dilution provisions.

Two-tier model

7.2. A recently published paper by Dr Lita Nelsen, director of the Technology Licensing Office at MIT, and Dr Katherine Ku, director of the Office of Technology Licensing at Stanford University, proposed the creation of a two-tiered system for UK spin outs. Such a system, when appropriate, would separate out the licensing process from the provision of business support services, with universities seeking differential levels of financial return depending on the tier used by the spin out, and the extent of support drawn upon.⁴³ The Academy can see considerable value in this two-tiered system being further explored. In particular, it has the potential to allow academic founders with the appropriate skills, aptitude and desire to be entrepreneurs, to identify and work with individuals, investors and organisations best suited to their company. By increasing demand for external entrepreneurial support services it may increase provision in the market, as well as introducing competition. Whether it is the academic entrepreneur or the university which decides the tier the spin out must use will remain a point for debate, but whichever tier is selected universities should be rewarded for the support provided. Some UK universities already employ similar systems, including the University of Cambridge.⁴⁴

Transparency and qualitative indicators

7.3. The Academy believes that if TTOs could increase the transparency of their operations it could improve the spin out process. It is the Academy's experience that a lack of understanding by the academic entrepreneur of the spin out process and the reasoning behind different perspectives of stakeholders contributes to difficulties encountered in the spin out process. The lack of transparency also puts academic founders at a disadvantage when entering negotiations. Consequently, the Academy believes that

⁴¹ [Connect People, Build Infrastructure, Growth Clusters, How to Make the Most of UK Innovation](#), David Cleevely, Sherry Coutu, Hermann Hauser and Andy Richards, 2014

⁴² [Golden Share & Anti-dilution Provisions](#), Tom Hockaday and Tony Hickson, 2015; [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

⁴³ [Are US university spin-out processes really better than those of UK universities?](#) Lita Nelsen and Katherine Ku, 2016

⁴⁴ Guidance note for the Research Office and Cambridge Enterprise IP Policy in practice, 2010

levelling this information asymmetry between the academic entrepreneurs and the university will result in an improvement in the spin out process for all parties involved. It is important to note that an increase in transparency does not necessitate standardisation. As a minimum, universities should ensure that their IP policies and information about their approach to the spin out process are easy to find and, ideally, publicly available.

- 7.4. Universities may wish to consider publishing anonymised details of the terms of deals they have agreed. Such information could provide a benchmark between universities and allow entrepreneurial academics to make informed choices about their own entrepreneurial activities and about where they may wish to work. It appears that US universities are exploring this option through the Association of University Technology Managers (AUTM) to increase transparency in technology transfer and sector-differentiated practice.⁴⁵
- 7.5. Another means of promoting universities would be for those that are confident of the performance of their TTO in supporting arrangements for research commercialisation to publicise statistics that demonstrate their efficiency and effectiveness. Greater public awareness of how universities approach research commercialisation could have a bearing on where entrepreneurial researchers and businesses choose to work. Such promotion of efficiency and effectiveness could be tied to qualitative indicators used by universities to monitor and incentivise TTO behaviour, such as the time taken to conclude negotiations. The recent report by the McMillan group suggests a number of possible indicators including levels of engagement, satisfaction of key stakeholders (including entrepreneurial faculty and funders), repeat business (such as with investors and industry) and evidence of impact.⁴⁶ The report also recommends exploring a mechanism, such as a benchmark, for recognition of university performance in supporting academic entrepreneurs, particularly early-career researchers. The Academy welcomes these suggestions.

Reward and recognition

- 7.6. As noted in the Dowling Review, the perception that activities relating to commercial endeavours are damaging to an academic career path persist and detract from the attractiveness of such activities for academics.⁴⁷ Universities need to ensure that recruitment and promotion criteria for relevant disciplines reward rather than penalise academics who have achieved excellence in translational and collaborative activities, and that these messages are communicated effectively. Furthermore, if universities value and want to encourage research commercialisation activities they need to provide their staff with sufficient time to engage in them.
- 7.7. Universities should also ensure that students and staff in appropriate subjects receive wider business skills and IP awareness training to improve their ability to undertake knowledge exchange activities across the course of their careers and help companies to generate and absorb innovation. Furthermore, increasing staff and student mobility between academia and industry would also be beneficial.⁴⁸ There are already a number of publicly funded schemes that facilitate the flow of people between industry and

⁴⁵ [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

⁴⁶ [University Knowledge Exchange framework: Good practice in technology transfer](#), McMillan group, 2016

⁴⁷ [The Dowling Review of Business-University Research Collaborations](#), 2015

⁴⁸ [The Dowling Review of Business-University Research Collaborations](#), 2015

academia and it is crucial that government continues to support and incentivise such activities.

Access to Finance

- 7.8. Sufficient and appropriate funding is required to support research commercialisation. Innovate UK administers several different types of competitive grants which facilitate research commercialisation. Serious concerns exist about whether the new financial products Innovate UK are developing will be effective in stimulating and supporting early-stage, high-risk and disruptive innovation, or business-university collaboration. Furthermore, there are concerns that accepting a loan rather than a grant may make a company less attractive to downstream investors. It would therefore be a mistake to substitute grant funding for loans; instead loans should be seen as a means of providing follow-on financing for innovations at higher technology readiness levels (TRLs).
- 7.9. There are numerous government backed schemes, tax incentives and initiatives in operation that aim to increase the availability of and access to finance for high-growth innovative businesses that are broadly regarded as useful by the engineering community. Although improvements to some schemes would be welcomed, the overriding message must be that the stability and longevity of successful schemes needs to be prioritised. It has also been suggested that the limits on the amount that can be invested through the highly regarded Enterprise Investment Scheme and Seed Enterprise Investment Scheme should be increased.
- 7.10. The establishment of UK Research and Innovation (UKRI) is a development of profound significance for the UK's research and innovation community and has the potential to have a positive impact on research commercialisation. Although the priority is for Innovate UK to maintain its business-facing focus, the new arrangement will also facilitate closer communication and collaboration between the Research Councils and Innovate UK which will undoubtedly be beneficial. Closer interactions between the organisations could further strengthen the offering for collaborative R&D and innovation support and enable a more seamless transition between the Councils of UKRI for high-quality research with strong commercial potential.⁴⁹

⁴⁹ [The Dowling Review of Business-University Research Collaborations](#), 2015