

BUILDING LONG TERM STRATEGIC UNIVERSITY-INDUSTRY PARTNERSHIPS

Lessons and effective practices from UK and US experiences



CSTI WORKSHOP REPORT

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About this report

This report sets out key lessons, insights and effective practices for developing and nurturing university-industry strategic partnerships (UISPs). It presents the findings from a workshop held in Cambridge UK in March 2014 to identify what needs to be done to strengthen the ability of universities and industry to develop mutually beneficial and effective strategic partnerships. It focused on the following key areas:

- » The nature of the value proposition and potential downsides
- » Initiating strategic partnerships
- » Nurturing and managing them
- » Building resilience and dealing with disruption and change
- » Roles for government agencies
- » Key challenges moving forward

The workshop brought together more than 70 senior thought leaders from leading UK & US universities, large research-intensive multinational firms and UK and US government agencies, to share their collective experience and develop the insights presented in this report. Participants included five of the global top ten universities; firms with a combined R&D spending of £16 billion across a range of sectors including aerospace and defence, oil and gas, pharmaceuticals, ICT and consumer goods; and key, primary national research and university funding agencies from the US and UK. The firms involved have long histories of working with US and UK universities and of developing major strategic partnerships. The discussions frequently identified lessons and practices applicable to building strategic partnerships in both the UK and the US. Important differences that were identified between the two countries have been highlighted in the report.

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The workshop was organised by:



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1 Introduction

Strategic partnerships are becoming an increasingly important feature of the university-industry landscape in the UK and US. There is mounting evidence to suggest that large, research-intensive multinational firms have been rationalising their investments in universities. These companies are focusing on a core set of strategic, longer-term partnerships with a selective group of universities, whilst curtailing the number of non-core universities with which they engage.

At the same time universities are responding to these trends – and to the growing belief that additional value can be derived from investing in long-term partnerships – by actively looking for strategic partners with whom they can form stronger, deeper and longer-term relationships. A particular concern in both the UK and the US, is that company decisions are increasingly being made on a global basis. Universities in both countries are also facing intensifying competition for these investments, not least from key emerging economies that offer both a greatly strengthened scientific base and large markets for these firms' products and services.

UK and US universities and their industrial partners have been experimenting with approaches to developing and nurturing such partnerships, and have been learning from these experiences. It is therefore critical that we reflect on, and learn from, their collective experiences to ensure that we have in place the necessary capabilities, processes and resources to compete for these types of larger-scale and higher-value investments in the future.

This report sets out key lessons and effective practices for developing and nurturing successful university-industry strategic partnerships (UISPs). It presents findings from a workshop held in Cambridge, UK in March 2014 to identify what needs to be done to strengthen the ability of universities and industry to develop mutually beneficial and effective strategic partnerships. The workshop focused on the following key areas:

- » The nature of the value proposition and potential downsides
- » Initiating strategic partnerships
- » Nurturing and managing them
- » Building resilience and dealing with disruption and change
- » Roles for government agencies
- » Key challenges moving forward

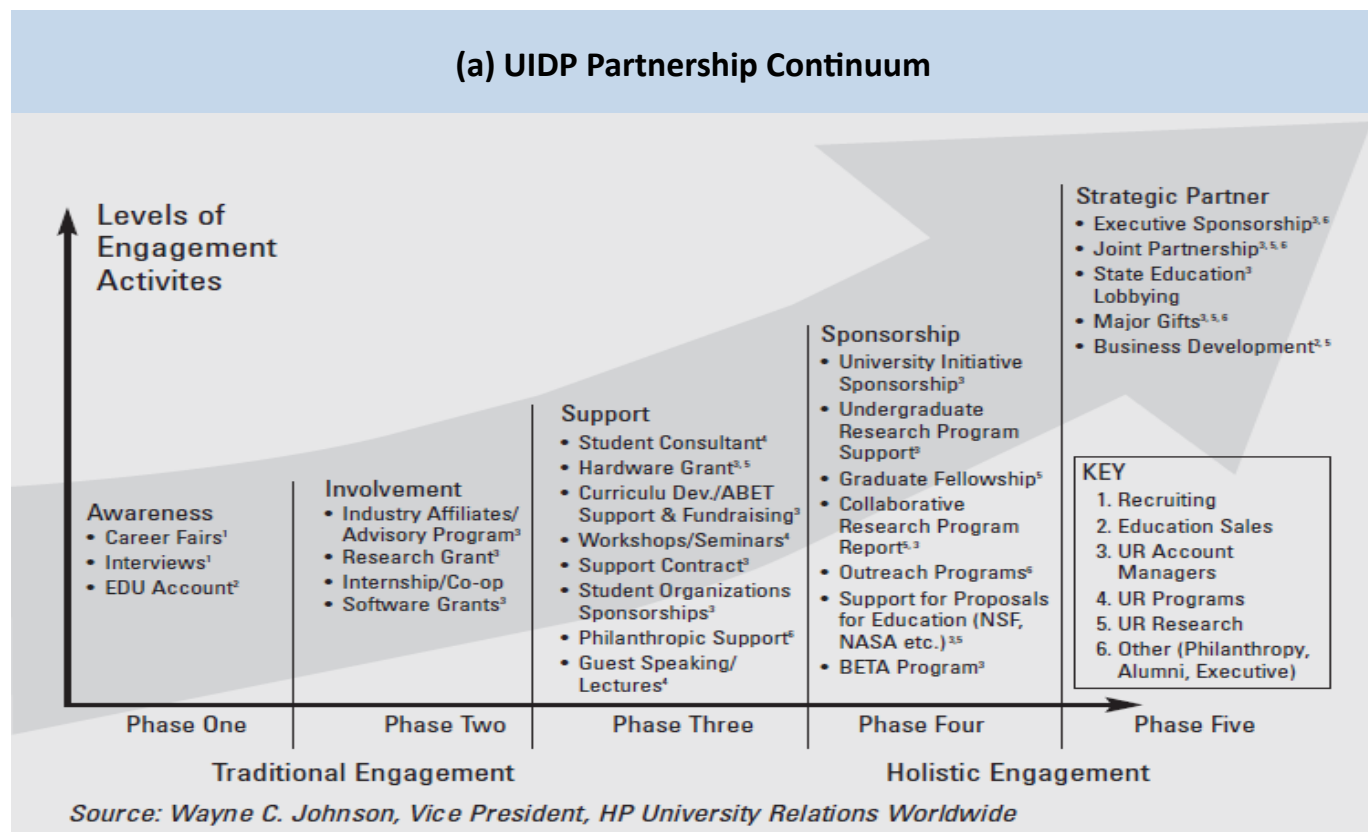
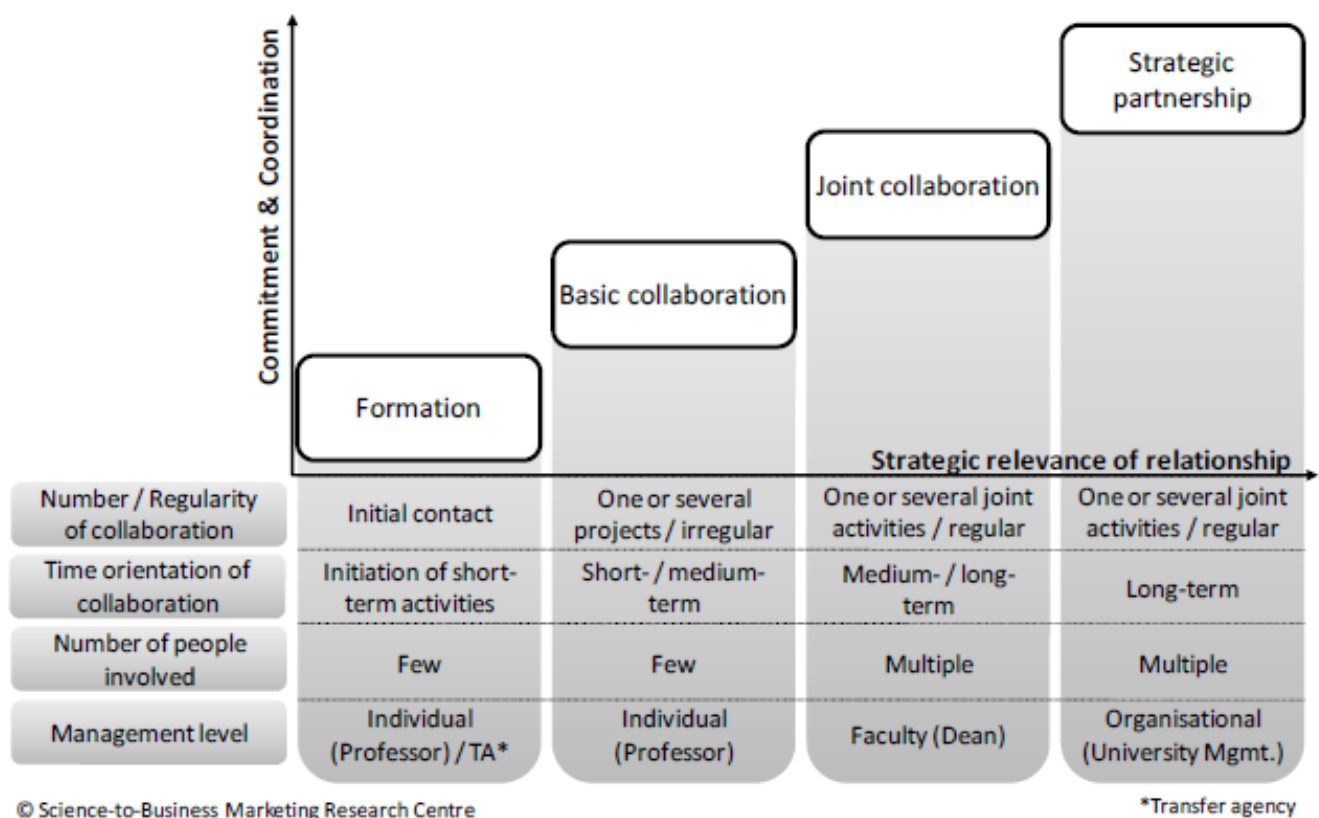
The workshop brought together more than 70 senior thought leaders from leading UK and US universities, large research-intensive multinational firms and UK and US government agencies, to share their collective experience and develop the insights presented in this report. Participants included five of the global, top ten universities; firms with a combined R&D spending of £16 billion across a range of sectors including aerospace and defence, oil and gas, pharmaceuticals, ICT and consumer goods; and key primary, national research and university funding agencies in the US and UK. The firms involved have long histories of working with US and UK universities and of developing major strategic partnerships. Expert panel presentations were followed by smaller, facilitated breakout sessions in which all delegates contributed their experiences and ideas concerning important lessons and effective practices in the key areas outlined above. The discussions primarily focussed on issues considered relevant to building strategic partnerships in both the UK and the US, with less time spent on country-specific areas. Any important comparisons that were made between the two countries have been highlighted in the report. The workshop also received input from a survey undertaken in advance of the event to identify key trends and challenges, and areas in need of effective practice development.

1.1 The partnership continuum

University-industry strategic partnerships are just one type of partnership model used to structure such relationships. It is important to set out clearly what we are looking at when we talk about such partnerships in this report.

Recent studies have tried to better define the different types of U-I partnerships. One framework – the Partnership Continuum – has been developed and refined by the US-based organisation, the University Industry Demonstration Partnership (UIDP), working closely with its members drawn from academia and industry. The framework places strategic partnerships at one end of a partnership continuum, characterised by an increasing degree of engagement (transactional, collaborative, alliances) and an increasingly holistic form of engagement (UIDP, 2012). Key characteristics include their longevity, the substantial commitment (and sometimes sacrifices) that need to be made by partners, the alignment of aspirations and objectives, and the development of deep, trust-based relationships. Some of the US universities and firms at the workshop actively deploy this framework for developing their U-I partnerships.

Figure 1: Partnership development frameworks

**(b) MUAS Stairway model**

Sources: (i) University Industry Demonstration Partnership (2012) Partnership Continuum: Understanding & Developing the Pathways for Beneficial University-Industry Engagement

(ii) Davey, T., Baaken, T., Galan Muros, V., and Meerman, A. (2011) The State of European University-Business Cooperation. Study on the cooperation between Higher Education Institutions and public and private organisations in Europe. Final Report.

On the other side of the Atlantic, a group at the Münster University of Applied Sciences in Germany developed the 'stairway model'. This emphasises the institutional level at which commitment and coordination takes place, and the strategic relevance of the relationship for each partner (Davey et al., 2011). The stairway model has been used by some UK-based universities to frame the development of their U-I partnerships.

In line with these studies, we chose to focus our attention at the workshop, and in this report, on higher-value partnerships with the following characteristics:

- » Are for the long-term
- » Transcend any one project and/or individual
- » Involve investment on all sides in developing deeper and more strategic relationships
- » Show commitment and coordination at department level or higher
- » Exhibit some degree of selectivity on the part of the firms and the universities
- » Aim to achieve a greater return on each partner's investment of resources beyond what could be achieved by repeated, project-based interactions

Within these boundaries it is helpful to identify different types of strategic partnerships that emerge. One useful way of revealing different types is by looking at the number of university and industrial partners involved:

- » **Bilateral:** one university – one firm (e.g. Cambridge – Boeing, Durham – P&G)
- » **University hub:** one-university – multiple firms (e.g. Dundee – pharma/biotech firms)
- » **Firm hub:** multiple universities – one firm (e.g. BP ICAM – multiple universities in UK & US)
- » **Multi-partner consortium:** multiple universities – multiple firms (e.g. Structural Genomics Consortium)

Another dimension discussed was the degree to which the intellectual property arising from the UISP is protected. Along this spectrum there are examples, such as the Structural

Genomics Consortium, where there are no IP restrictions in place; bilateral partnerships where strong IP agreements are put into place; or multi-way partnerships where IP is shared amongst the group of participating institutions.

1.2 The strategic partnership journey

Discussions before the workshop, with key speakers from academia and industry, continually emphasised the importance of exploring the dynamics of UISPs. Far from static entities, these change over time as a result of joint organisational learning, internal shocks such as leadership changes or company strategy, and external shocks such as the emergence of a new, disruptive technology or changes in government policy and regulations. The UISP journey was therefore separated into three distinct phases (Figure 2):

- » The period in the run-up to the UISP, including its formation
- » Nurturing and managing UISPs to realise value during periods of relative stability
- » Developing partnership resilience to effectively navigate turbulence and deal with change

The workshop was structured to reveal key lessons and effective practices in each of these phases.

1.3 The rise of university-industry strategic partnerships

The workshop survey revealed the extent of the increase in UISPs. Over the past ten years (2004-13), 51% of respondents believed that significantly more activity had been channelled into strategic partnerships between universities and large firms. A further 38% believed there had been a slightly positive change. This is consistent with the findings of a recent PraxisUnico workshop which concluded that: "industry is getting more selective in the way it chooses to engage with the research base. An emerging theme was for fewer, stronger partnerships." (PraxisUnico, 2013).

However, the speed of the rise seems to be slowing down. Looking forward to the next five years, only a third of

Figure 2: Different phases of the strategic partnership journey

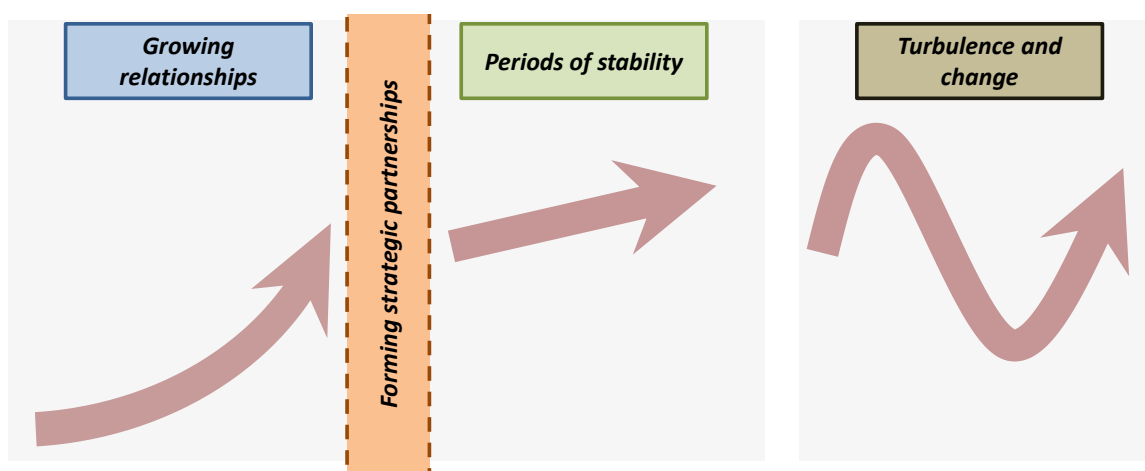


Table 1: Opportunities for developing strategic partnerships: as perceived by industry respondents (% of respondents)

% <i>firm respondents only</i>	Greatest opportunities - ranks 1-2		Opportunities - ranks 3-5	
	10 years ago	Now	10 years ago	Now
USA	92	71	0	7
UK	54	50	15	21
Europe (general)	23	29	23	7
China	0	14	15	50
India	0	7	0	21
Brazil	0	7	0	21
Germany	8	7	31	21
France	0	7	23	14
Japan	8	0	23	7
Singapore	0	0	0	14
Australia	0	0	8	0
Other	15	7	23	29
Number of respondents	13	14	13	14

Note: Respondents were predominantly UK/US-based multinational firms with a combined R&D spending of £19 billion in 2011

Source: CSTI strategic partnerships workshop survey 2014, industry respondents only

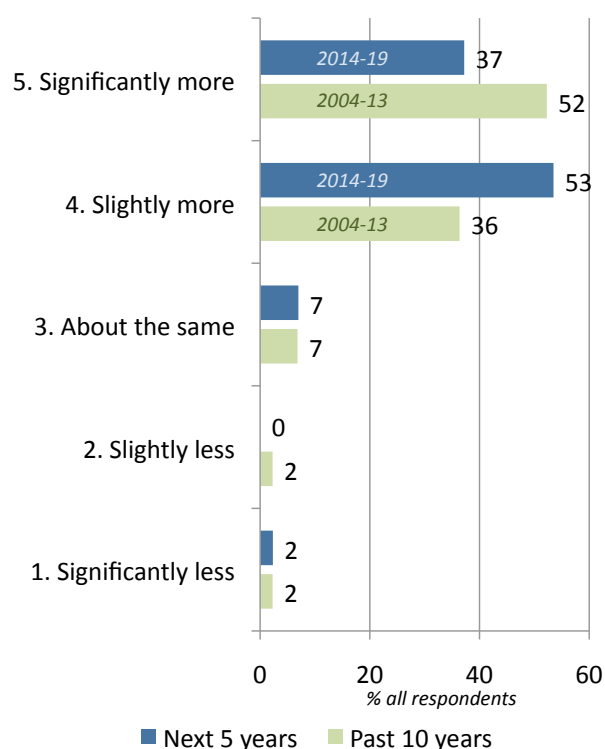
respondents believed the amount of activity with large firms through UISPs would significantly increase, while 56% believed it would do so slightly.

The findings also highlighted that UISPs were being developed across a range of sectors in the economy. University respondents believed that the sectors most active in forming UISPs were life sciences/pharma/biotechnology; software, ICT and computing; healthcare and medical technologies; energy; general engineering and manufacturing; and aerospace and defence.

Universities in the UK and the US are also facing increasing global competition for major strategic investments by companies into the public research base. The survey responses from industry – representing primarily UK/US-based multinational firms with a combined global R&D expenditure of £19 billion in 2011 – suggest that there is some weakening in the US position over the past decade in terms of providing the greatest opportunities for university-industry strategic partnerships, although it is still the primary choice for just over three quarters of industry respondents. The UK was consistently ranked in the top two choices by just over half of the industry respondents.

However, beyond this, China is clearly emerging as an increasingly popular place to form such partnerships. Half of respondents believed there were opportunities to realise value through partnerships with Chinese universities, compared with just 15% 10 years ago. This finding was echoed during the workshop discussions. Emerging economies such as China and Brazil offer large potential markets for many MNCs, combined with strengthening scientific and technological capabilities. The firms at the workshop suggested that there

was increasing pressure to relocate their R&D activity to these large markets and that this could have significant knock-on effects for the location of their UISPs.

Figure 3: Perceived change in the level of activity channelled into strategic partnerships between universities and large firms

Number of respondents: 44

Source: CSTI strategic partnerships workshop survey, 2014

2 Exploring the value proposition

“Long-term commitments are believed to deliver results that have more impact than isolated collaborative projects, and can provide a broader range of benefits to all parties involved.”

Key guiding principle for developing university-industry partnerships from the US President’s Council of Advisors on Science and Technology report: “University-Private Sector Research Partnerships in the Innovation Ecosystem”.

The above quote from a 2008 US report highlights the belief that long-term, university-industry strategic partnerships deliver additional value, both in nature and scale, compared to other types of partnership model. There is a consensus – observed both at the workshop and found in other practitioner studies of university-industry partnerships (e.g. UIDP, 2012; Science/Business, 2012; PraxisUnico 2013) – that large-scale, strategic partnerships must focus on the delivery of mutual value to create win-win partnerships. In addition, UISPs are resource-intensive, challenging and potentially risky. Universities and firms entering into such arrangements should be aware of the potential downsides and trade-offs. This section presents the findings of the panel discussions and breakout groups on the types of added value realised by both industrial and university partners. It then goes on to examine potential downsides and trade-offs that partners should be aware of.

2.1 Benefits for the industrial partner

Benefits realised by the industrial partner from a UISP are both diverse and complex. This is not least because UISPs often involve many interactions between multiple individuals and groups within universities and firms, each addressing different needs with varying time constraints for delivering outputs. Figure 4 brings together these insights from the workshop, identifying six key categories of benefits realised by the industrial partner.

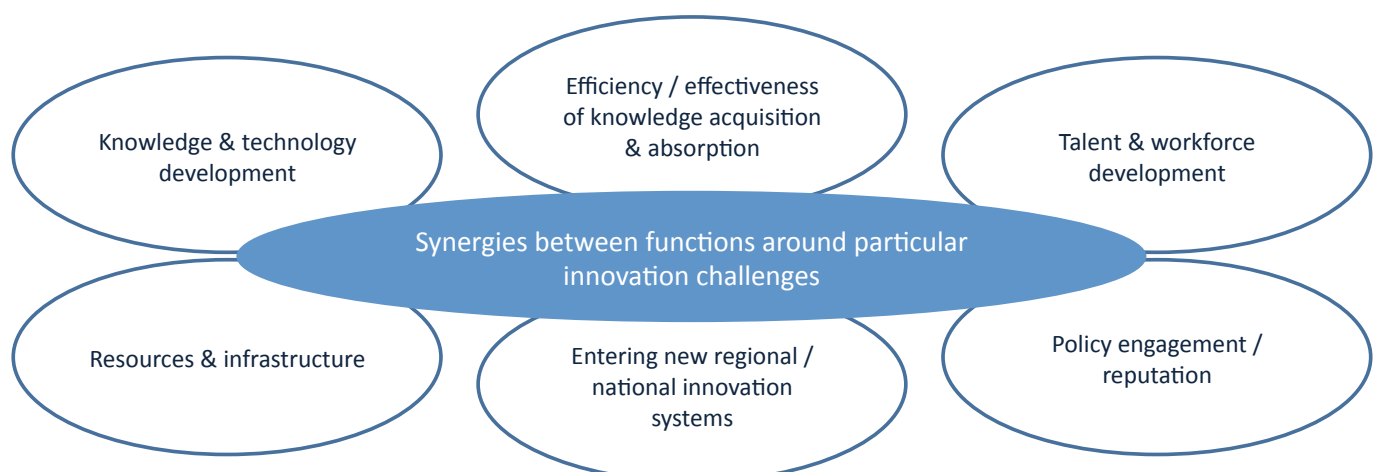
Generating new knowledge and supporting technological development

Arguably, the primary category of benefit for firms engaging with universities through UISPs is the ability to tap into the knowledge and expertise to be found within universities. Importantly, they are able to work together to shape the direction of research and the type of knowledge generated to ensure that it is aligned with the technological and innovation needs of industry. In addition, the rich dialogue between researchers and industrialists, that often results from successful UISPs, can stimulate firms to ask new and different questions, which in turn can lead to disruptive advances in technologies.

Delegates identified the following benefits arising from having a UISP in place:

- » Addressing longer-term, larger-scale and riskier innovation challenges than could be achieved internally
- » Providing stability and a protected space for the firm to fund the R&D activity necessary to generate fundamental advances and applied knowledge that will underpin next generation technologies and future competitiveness
- » Shaping the direction of research by increasing academics’ understanding of industrial and technological challenges that require advances in fundamental understanding
- » Approaching problems from novel perspectives and asking new questions about how to meet particular industrial challenges

Figure 4: Categories of benefits enabled by strategic partnerships



- » Providing a focal point around which to build critical mass so that long-term innovation challenges can be addressed
- » Enabling technologies to be developed further along the innovation value chain
- » Providing an exploitation route for knowledge and technologies developed within the research base
- » Accessing and leveraging complementary research capabilities and specialist infrastructure
- » Leveraging additional funding for R&D by collaborating closely with universities, allowing greater financial leverage for all partners involved
- » Academics can offer an objective interpretation of different viewpoints, particularly in contentious areas of science

Enhancing the efficiency and effectiveness with which external knowledge is identified, developed and absorbed

UISPs also help to strengthen the ability of firms to identify, develop and absorb knowledge, resources and expertise from within the university base. Central to this are close, trust-based relationships, open and honest communication, and a culture of learning, coupled with a strong willingness to adapt. Honest and open dialogue creates a much greater understanding of each partner's needs, capabilities, challenges and – importantly – constraints.

The delegates identified the following benefits for industrial partners:

- » Greater sharing of ideas, know-how, next generation challenges and increasingly proprietary resources
- » Rich dialogue and trust between partners encouraging the reframing of research questions and identification of new research areas that can lead to the development of disruptive technologies
- » Reduction in costs associated with locating relevant expertise and knowledge, and scientific advances, within the partner university and elsewhere in the research base
- » Stronger mechanisms for outputs to be absorbed back into the wider organisation as both partners improve their understanding of which approaches work and which do not, as well as their willingness to adapt and experiment with new mechanisms
- » Easier access to complementary capabilities and resources within the partner university facilitating the process of exploiting and commercialising the knowledge generated through the partnership.
- » Reduction in the costs associated with repeated negotiations and contract formulation when multiple projects are being developed
- » Faster starts for new research projects, allowing partners to focus on furthering their research objectives rather than getting tied up in repeated and costly negotiations

Developing talent, workforce skills and capabilities

There are also important potential benefits for firms'

recruitment activities, as well as for developing talent and workforce skills. The following were discussed by delegates:

- » Reducing the costs of searching for talent across all levels of academia, both for recruitment purposes (particularly at undergraduate, graduate and postdoctoral levels), and for developing external relationships to support innovation activities
- » Strengthening awareness amongst student communities of the firm and the career opportunities it offers
- » Providing opportunities for students to engage in the partnership's activities – through internships, project-based activities etc, strengthening their industrial/work experiences and increasing their employability
- » Informing curriculum development concerning industrial challenges and skill needs, and helping to develop students' knowledge and wider capabilities during their university career
- » Developing internal skills and capabilities for effective partnerships with universities and industry, applicable to other external collaborations undertaken by the firm

Enabling access to resources and infrastructure

Strategic partnerships between universities and firms can provide access to resources and infrastructure that would be difficult to achieve through other forms of interaction. The benefits are realised not least because of the strong trust developed, which allows firms to take calculated risks when releasing increasingly proprietary resources, in the knowledge that they will not be compromised. The longevity and scale of these partnerships also means that resources can be committed that would be difficult during one-off, or more ad hoc projects. Such long-term, strategic commitments:

- » Make it easier for partners to justify larger-scale investments in dedicated physical infrastructure (e.g. the building of labs and buildings) and the development of specialist equipment
- » Enable firms to contribute increasingly proprietary resources (e.g. datasets, materials and equipment) to the relationship

Facilitating entry into new national or regional innovation systems

In some cases, long-term strategic partnerships with universities can help firms access new regional and national markets, sectors and technologies, not least because they help them develop their capabilities, networks and legitimacy. This is particularly the case if the firms have little prior presence in these areas. By making long-term, large-scale strategic commitments to key universities in relevant innovation systems, firms send an important signal to other players (e.g. competitors, customers, policymakers and government funding agencies) of their intentions to play a serious part in that space. Close relationships with key universities in these target innovation systems can help firms to:

- » Raise the visibility and reputation of the firm as a legitimate organisation contributing to the R&D and innovation activities of that economy, particularly amongst local policymakers and funding agencies
- » Strengthen access to key, local scientific and policy networks, including links with other universities and research institutes in the target economy, through close strategic relationships with key senior academics and university leaders
- » Help to develop local skills and expertise relevant to the firm's activities in that economy
- » Leverage regional investment for innovation through strategic university engagement

Supporting policy engagement and institution development

In addition, there was evidence that some UISPs seek to address not just the technological challenges of their next generation technologies and products but also to understand and influence the socio-political and technical institutional framework within which the technology will be embedded. The following benefits in particular were identified:

- » Research and other activities undertaken within UISPs can focus on understanding issues relating to the development of wider socio-economic conditions, public acceptance and technology legitimacy associated with deploying the technical advances being developed at the heart of the partnership
- » The activities of UISPs can also generate important insights for policymakers and develop new funding programmes for emerging technologies
- » UISPs encourage dialogue between universities, their strategic industrial partners and governments, creating a strong platform from which to help shape policies and programmes and develop support for the emergence of new technologies

2.2 Benefits for the university partner

The longevity, depth and scale of the commitment made by the different players involved in strategic partnerships suggests it is extremely important that each partner – university, company or government – realises significant benefits for their respective organisations, beyond what they would obtain from more transactional, project-based interactions. Below are some types of benefits often realised by university partners through involvement in UISPs.

Securing research funding and developing critical mass

- » Helps academics to secure funding to work with industry, identifying hard industrial, technology and innovation-related challenges requiring advances in different types of knowledge and, frequently, fundamental understanding – these are the challenges most likely to excite and motivate academics

- » Provides a source of longer-term and larger-scale funding for university research, student activities and other related knowledge exchange activities
- » Helps to leverage other sources of government funding, for example those requiring a matched component
- » Provides a focal point around which to develop and coordinate a critical mass of resources and activity, often from across the university and going well beyond the scientific and technical disciplines, to address major innovation challenges

Shaping research directions and pathways to impact

- » Builds greater understanding of industrial innovation needs helping to target knowledge-generation and diffusion activities more effectively to areas where they can generate the greatest social and/or economic impact
- » Provides a clear pathway to impact for the exploitation and commercialisation of research undertaken within the university and through its partnership activities
- » Accesses resources and expertise in industry
- » Provides access to specialised facilities, equipment, materials databases and other resources in industry, some proprietary, to support research activities, and which would otherwise be very hard to access
- » Enriches the student experience and offers recruitment opportunities, including internships and industry-based work experience, working on industrially-defined research projects, providing students with a deeper understanding of career opportunities

Building capabilities for working across the interface

- » Strengthens researchers' capabilities for working effectively at the industry-academic interface through close working with industrial partners over long periods of time
- » Builds effective routines for working at the industry-academic interface, including mechanisms for transforming knowledge developed within the partnership into practical use. This learning can be applied in other contexts and to other types of non-strategic partnerships

Driving local economic development

Partnerships can offer a plethora of potential benefits for the local economy, not least the often sustained, multi-million pound R&D investment. If the UISP involves establishing a physical presence, new R&D and associated support jobs can be brought to the local area. The UISP may effect the development of underlying scientific capabilities and competences in the local economy, leading to the development of scientific and technological clusters centred around the university.

2.3 Downsides and trade-offs

The workshop also explored potential downsides and risks for university-industry strategic partnerships. These need to

be balanced against the potential benefits and steps taken to mitigate their effects. Delegates identified the following issues.

Potential for selecting the wrong partner

Large, research-intensive firms, like universities, are typically not monoliths with a single voice, and are quite diverse organisations. Different business units may well have different objectives, be working to different timescales, and have different cultures and working routines. They will inevitably have different technology, skills and business-related challenges that could benefit from engagements with universities. However, these differences could lead to tensions within the firm concerning the 'right partner' with which to form a strategic relationship. In addition, if the choice of partner focuses too heavily on capability/objective alignment, with little regard for the motivations and willingness of the academic partners to work with that industrial partner, there is a danger that the right partner on paper will become the wrong partner in practice.

Potential for 'lock in', loss of agility and missed opportunities

There is also potential to become 'locked in' to the existing partnership making it harder to switch should opportunities arise elsewhere. This may arise, for example, when:

- » High costs have been incurred in order to develop an effective partnership; or increasingly strong and close social ties have been formed at local level between researchers and industrial scientists
- » There is a high cost associated with switching partners. This could arise from various factors including long-term financial commitments, contractual commitments, or close personal ties. If high switching costs exist, partnerships built around a small number of key academics may find themselves particularly vulnerable should these individuals move on

An overreliance by the firm on a small number of core partners may also increase the risk of:

- » Becoming less agile
- » Missing opportunities elsewhere in the research base

This can be a particular issue in sectors and firms where innovation priorities change relatively quickly. Close personal relationships may also make it harder to terminate individual projects that turn out to be of little relevance or commercial value to the industrial partner, again reducing the agility of the partnership and making it harder to adapt to the changing innovation needs of the firm.

Universities may find themselves financially vulnerable if a partnership breaks down or terminates in cases where too high a proportion of a university or department's funding derives from a small number of major partnerships. Steps may also need to be taken to ensure that these institutions are not overly influenced by a single – or small number of – external organisations

Universities can find it difficult to form major partnerships with competing firms due to formal restrictions in the UISP contracts, or informal social pressure. This highlights the importance of the initial selection process to ensure that the chosen industrial partner is right for the institution as a whole, over the longer term.

Risks to careers and wider institutional reputations

The termination of major, long-term strategic relationships – if handled badly – also has the potential to inflict considerable damage on the careers of researchers, and more widely on the institutions involved. This can have long-term effects due to the long institutional memories of both universities and firms. This places great importance on ensuring that any bad experiences are minimised and dealt with appropriately and sensitively. If left unchecked, such experiences can wreck both individual and institutional reputations and destroy partnerships. Strong social networks within both the academic and industrial communities mean that the consequences of bad experiences can be far-reaching. Delegates noted that there was wide recognition of those partners who do not 'play nicely together' or who do not deliver, and that blacklists do exist – either implicitly or explicitly.

Overstretching, overreaching and challenging timescales

Given that developing and nurturing effective strategic partnerships can be resource-intensive, universities that commit to hosting too many strategic partnerships run the risk of not being able to adequately support them all. This can lead to overpromising and underdelivering. This, the workshop delegates warned, is an easy way to damage both personal and institutional reputations and hamper the development of a partnership.

Different parts of the university may also work at different speeds, with different turnaround times for projects and varying abilities to deliver to tight timescales. When relationships migrate from one part of the university to another, there is a danger that expectations may not be adjusted, leading to poor experiences that affect the wider relationship.

Ineffective or inappropriately-structured UISPs can also lead to a 'bland' partnership, with partners unwilling to share real problems or commit the necessary expertise and resources. There is a constant challenge in determining how much (sensitive) information should be revealed to ensure that the partnership focuses on the most valuable topics for the firm.

Risk of proprietary knowledge leakage

There is potential for proprietary knowledge, including clues concerning a firm's future technological developments, to be unintentionally or intentionally leaked to competitors or other interested stakeholders in the global innovation system. Building strong, trust-based relationships, backed by appropriate contracts, is central to minimising this risk.

3 Initiating strategic partnerships

Long-term strategic partnerships can enable additional value to be realised through interactions between universities and their industrial partners. However, they can be challenging to set up. Table 3.1 presents the top ten challenges identified by universities and firms in the workshop survey undertaken in the run-up to the event. Misalignment of objectives and motivations was the top challenge for both universities and firms, with contracts and IP negotiations also presenting special challenges. Points of difference are highlighted in the table with universities, for example, perceiving that a lack of experience in developing and managing such partnerships presents them with particular challenges, as does the lack of partnership support capabilities and resources. Firms, on the other hand, see unrealistic expectations over timescales and deliverables as problematic, as well as restrictions imposed by government rules and regulations.

This section first explores the diverse origins of relationships that turn into strategic partnerships before presenting the lessons and effective practices identified by delegates for initiating them.

3.1 The diverse origins of strategic partnerships

Strategic partnerships have a wide range of origins. These range from personal relationships developing into something bigger, deeper and more comprehensive, to strategic decisions made by the firm's leaders to target specific universities. While the former have challenges associated with transferring the relationship from an individual to an institutional-level, the latter have the additional challenge of building up from scratch the trust and working relationships critical to success.

Table 1: Top ten challenges identified by universities and firms in initiating strategic partnerships

Top ten challenges during initiation					
University perspective			Firm perspective		
Uni rank	Description	Firm rank	Firm rank	Description	Uni rank
1	Misalignment of objectives and motivations	1	1	Misalignment of objectives and motivations	1
2	Organisation's leadership not fully committed	5	=2	Contract and IP negotiation process: obstacles and timescale issues	3
=3	Contract and IP negotiation process: obstacles and timescale issues	2	=2	Lack of clarity over objectives, roles and tasks	6
=3	Institution-level connections / points of contact inadequate	10	4	Internal bureaucracy of organisation gets in the way	5
5	Internal bureaucracy of organisation gets in the way	4	5	Organisation's leadership not fully committed	2
=6	Lack of clarity over objectives, roles and tasks	2	=6	Expectations over timescales, outputs and value unrealistic	12
=6	Lack of experience in developing and managing partnerships	10	=6	Government rules and regulations too restrictive	18
8	Trust not developed between partners	8	=8	Trust not developed between partners	8
9	Capabilities and resources for partnership support (e.g. project management, commercialisation, admin) insufficient	=14	=8	Public funding schemes not conducive to strategic partnerships	15
=10	Governance and management structures inadequate	=14	=10	Institution-level connections / points of contact inadequate	3
=10	Capacity constraints on research staff from non-partnership duties	20	=10	Lack of experience in developing and managing partnerships	6

Number of respondents: universities (31); firms (14)

Shading highlights points of difference between universities and firms

Source: CSTI strategic partnerships workshop survey 2014

Sowing many seeds: organic growth of existing relationships

The consensus at the workshop was that many successful UISPs emerge out of individual relationships between academics and a company's technical staff. However, the workshop also highlighted ways in which other types of relationships and interactions can seed a UISP, unconnected with research activity. Examples included the provision of bespoke executive education courses developed by the university for a firm; and relationships established for recruitment purposes turning into larger partnerships for research and skills development.

It all starts with that technical relationship. That faculty member at the university and the technical lead at a company finding a common problem of mutual interest and they talk about how they might solve that problem.

US university leader

These individual-level relationships help to build up trust and understanding and to establish communication channels, all of which were believed to be important foundations for effective UISPs. In addition, they can also help to demonstrate the potential value of investing in a more major relationship and act as test beds for developing effective working practices at the interface. This helps the UISP to 'hit the ground running'.

An important consequence of the above is that any mechanisms that increase the number and quality of relationships between universities and firms should increase the potential for UISPs to emerge. However, one MNC noted that government programmes, such as joint R&D programmes, while useful for establishing new relationships and providing the initial test bed to determine whether they are suitable partners, were no guarantee that the relationship would be successful and grow into something of longer-term and higher value. This depends on many other factors and conditions.

Both universities and firms should ensure that relationships formed between academics and industry have the flexibility, space and support to develop into something bigger, deeper and more comprehensive if there are potential benefits from doing so.

Strategic decisions at leadership level

There are also instances – albeit less frequent – where successful UISPs originate from strategic decisions made by senior leaders of the university and firm involved. Indeed strong endorsement at this level can be important for empowering staff to develop the partnership.

There are also examples where strategic decisions concerning important technological or innovation challenges have led

to a formal tendering process to identify and select possible partners. In addition, the firms and universities present at the workshop recognised that some technological and scientific challenges of importance to industry – not least in the pharmaceutical industry – are of such a scale and time span, and involve such technical risks, that there are few alternatives to developing long-term, strategic partnerships with universities and, often, competitor firms.

Where UISPs emerge as a result of strategic decisions taken at leadership level, delegates were keen to point out that this could introduce additional challenges, both to get them off the ground and to make them work effectively. These included the need to motivate academics and company R&D staff to engage fully with the new partnership. The receptiveness of academics, and also industrial staff, to top-down direction from a senior level was thought to vary considerably between different academic institutions and indeed between different parts of a large firm (for example between central R&D units and business units).

3.2 Navigating large, complex organisations

Universities are typically described as fragmented, networked, and often devolved organisations. This can introduce difficulties for firms and other organisations in identifying appropriate partners within the university base, navigating internal politics and bureaucracies, and forming effective relationships.

It was also clear from the workshop that universities need a better understanding of the complex organisational structures of large firms. These complexities can lead to quite different value propositions depending on which part of the firm is being engaged with. They may also require different capabilities, practices and protocols for working effectively at the interface and delivering value to the organisation.

Any large MNC like ourselves is a complex animal and we have very different stakeholders within the organisation. We are a collection of entities ... [and] they've all got different timescales and objectives. So we spend as much time managing them as managing the university partners.

Company executive

Large firms – in particular multi-product multinationals – often consist of many different constituencies, for example: multiple, product-driven business units with different product lifecycles; central R&D groups; manufacturing; human resources; finance, and so on. These are often diverse, and different units are likely to operate at different timescales (e.g. short turnaround times for a product business unit compared to longer timescales for central R&D). They will have

different objectives and expectations about how a university can contribute to their activities (e.g. problem solving for a specific product business unit, fundamental advances in science for central R&D, or more cost-effective recruitment search processes for HR). They may also have different prior experiences of working with academics or other knowledge providers, and have managers with different capabilities and management styles for working across the university-industry interface.

These differences can lead to internal tensions and conflicts over the role and value of a strategic partnership. Importantly:

- » The value proposition may well need to vary depending on which part of the firm is being engaged with, and may need to be constructed in different ways for different audiences
- » Thought needs to be given concerning ways to integrate the UISP into different groups within the firm, and to identify emerging needs and channel these back into the partnership. It is also important to ensure that outputs reach the target user community within the firm
- » Dedicated resources may be required to engage with different groups internally, both to secure commitment and buy-in, and to create pathways from the user communities to the strategic partnership interface
- » The UISP is likely to have to navigate potentially complex internal politics in both the university and the firm

Universities therefore need to understand the complexities of dealing with large firms.

3.3 Identifying partnerships that should become strategic

When exploring the origins of UISPs, it is clear that many emerge from planting multiple seeds and nurturing their organic growth, with the aim that some will become strategic partnerships. Others emerge from a more deliberate strategic decision by the firm to target particular universities. In this process, one is inevitably faced with the challenge of identifying which relationships should – or should not – become strategic, and when it is most appropriate for this to happen. For those that arise from strategic decisions, there is also the challenge of finding the right potential partners to approach. In some cases partners may be both obvious and limited to a few universities (e.g. where the necessary expertise is concentrated within a small number of locations). In other cases there may be a greater number of options available. The workshop explored processes for identifying and selecting potential strategic partnerships.

Narrowing down the search

Where UISPs do not naturally evolve from existing relationships, a key part of the initial process is the search for potential partners. Many of the large firms at the workshop noted that, as with any large investment and commitment, appropriate due diligence is often undertaken. This can

include the identification of alternative partner options (e.g. different centres of excellence around the world) and how these would add value to the firm's activities, as well as working with the university to map needs to capabilities, to ensure sufficient alignment.

Effective due diligence is often made harder because of the lack of a comprehensive and robust set of comparable metrics relating to the capabilities and competencies of universities to work effectively with industry and to support different types of innovation (beyond the nature and quality of their research). Where metrics do exist, they often relate to quite a specific competence or capability (e.g. quality of research in specific domains); lack comparability internationally; lack comparability between institutions; or lack the appropriate level of granularity.

A number of sources of information were identified to help in identifying potential partners:

- » **Bibliometric databases and tools:** these can help identify centres of research excellence, key institutions and individual academics within specific research domains, and the evolution of research domains. However, these databases say rather little about how well a particular institution or academic works with industry, apart from examining the degree of co-authorship across the university-industry interface. This is at best a partial measure of the capability to work effectively with industrial partners
- » **Government research funding agencies** are another potential source of valuable information. Agencies in both the UK and US are considering how they can organise their databases to make it easier for users to search for and identify specific research partners within the academic base. In addition they can act as brokers, helping to bring tacit knowledge and wider knowledge of the capabilities and competencies of universities to work with industrial partners. More detail is provided in Section 6 of this report
- » **University-industry membership organisations** – such as PraxisUnico and the National Centre for Universities and Business in the UK and the University Industry Demonstration Partnership and the Association of University Technology Managers in the US – provide an important focus for building social networks between universities and firms. Critically, they provide a network in which opportunities for collaborative partnerships can be shared, effective practices can be developed, and insights into which universities and firms collaborate successfully are revealed. The workshop discussions strongly demonstrated that there is a deep understanding within social networks of which universities and firms are 'good' partners and which do not 'play nicely'

Both universities and firms have found the development of frameworks useful for supporting due diligence and decision-making processes. Frameworks – such as the Partnership Continuum advanced by the UIDP, or IBM's '6Rs' (Research,

Readiness, Recruiting, Revenue, Responsibility and Regions)¹ – can help to reveal and explore where value lies within a proposed strategic partnership and the mechanisms through which it will contribute. They can also bring clarity to quite complex value propositions and help to communicate this to others.

Identifying existing relationships that should become strategic

Many academic interactions with firms can become long-term relationships built around trust and repeated interactions. However, not all should become strategic, institution-level partnerships. The workshop explored how to identify emergent relationships that have the potential to become UISPs.

A key challenge in this process derives from the complexity and fragmentation of both university and company structures, making it difficult to identify the full extent of existing linkages between organisations. Universities, for example, do not often require academics to report their interactions to any centralised unit (with the possible exception of some formal contractual engagements such as research contracts). Decision-making powers and budgetary control within firms may also be devolved to the extent that different divisions make their own decisions regarding which academics to engage with, without notifying other parts of the firm let alone a central unit. There therefore may be no single entity within either a firm or a university that has complete knowledge of how interactions between a particular university or firm are developing and growing.

Understanding which existing relationships should become strategic therefore often relies on individuals being aware of the potential value of forming a strategic partnership:

- » Universities (and firms) can develop clear signposting within their organisation so that individuals know whom to approach to explore potential partnerships and for support
- » Central units within universities can proactively invest resources to investigate the breadth and strength of existing academic/industry relationships and reflect on possible synergies, and advantages and disadvantages of formalising and further developing the relationship. However, this is resource-intensive and often needs some trigger or further information to narrow down the search process

Making the selection

The workshop identified a distinct need to improve our understanding of the criteria for evaluating whether or not a relationship should become strategic. While the criteria will inevitably vary from institution to institution, the discussions nevertheless revealed a range that could form the starting point for internal reflection on what should be considered. These are shown in Table 2 overleaf.

1 See, for example, Sphorer, J. (2011) Holistic Service Engineering for a Smarter Planet: Working Together to Build a Smarter Planet, presentation September 15, 2011

"It is not all about money... money is always useful and it helps to lubricate, but the most fruitful collaborations are ones where it is about sharing resources, capabilities, expertise... where parts are complementary and neither one party can do the whole thing all by themselves."

UK university leader

In addition, it is important that both partners undertake appropriate due diligence prior to partnership formation, fully exploring the potential risks and downsides of the partnership and identifying ways to mitigate these.

Many of the firms involved in research-driven strategic partnerships noted the particular importance of scientific excellence as a pre-requisite in the choice of partner. However, this was rarely a sufficient condition, with other factors also playing an important role in partner selection. For example, one case was highlighted where a partner lacked scientific supremacy in the target domain for the partnership. However, they were world leaders in the core building blocks required and were committed to investing and shaping these to become a global centre of excellence.

Other factors, alongside scientific excellence, included: a good understanding of each other's needs; a track record of success in working effectively with industry; a willingness and enthusiasm to engage with industrial partners and a culture that values working with industry (note that this does not mean at the expense of fundamental research); flexibility and responsiveness; and, increasingly, the ability to form partnerships with others and become the central node in a global network.

First impressions were also very important – both for universities and firms. This makes the choice of individuals involved in exploring the potential for a strategic partnership particularly important.

While the process of forming strategic partnerships is often necessarily case-specific, some have introduced a formal structure to aid the identification and development of such partnerships. Coventry University, for example, has adopted the strategic partnership stairway model developed by the Science to Business Marketing Centre at Münster University of Applied Sciences². This provides a framework for managing university-business relationships at different stages of development with strategic partnerships representing the deepest and broadest form of partnership.

2 Further information can be found in Davey, T., Baaken, T., Galan Muros, V. and Meerman, A. (2011) The State of European University-Business Cooperation Final Report - Study on the cooperation between Higher Education Institutions and public and private organisations in Europe, a report to the European Commission DG Education and Culture

Table 2: Range of potential criteria for selecting strategic partnerships

Category	Criteria
Objectives and focus	Mutually beneficial
	Aligned to each partner's missions
	Aligned expectations (interests, objectives, outcomes)
	Understanding of each other's needs, capabilities/competencies and constraints
	Role/fit within wider portfolio of partnerships
Motivations, commitment and buy-in	Own motivation for forming the strategic partnership
	Partners' motivations for forming the strategic partnership
	Commitments/buy-in at appropriately senior levels of each institution and from other critical decision makers
	Willingness/desire of academics and industrial researchers to engage over longer term
Resources, capabilities and competencies	Balanced commitment of resources from each partner
	Strategic fit of partners' resources, capabilities and competencies
	Sufficient quality and scale of capabilities and competences
	Potential for leveraging financial and non-financial resources
	Capacity and resources available to develop and support the partnership
	Capability, resources and commitment for proactively managing the partnership
Flexibility, responsiveness and growth potential	Willingness to be responsive to changing needs and conditions
	Potential for partnership to grow/spread beyond initial scope
	Willingness to co-develop new capabilities/competencies
Wider institutional effects	Reputational risks and benefits
	Effects on other current/future institutional strategic partnerships
	Effects on capacity to deliver wider organisational objectives
Deliverables and timescales	Realistic assessment of timescales for delivering outputs
	Appropriate structure of outputs
	Consideration of knowledge/technology transfer pathways back into organisation
Agreements (formal and informal)	Consistent with wider institutional mission and objectives
	Non-negotiable terms or boundaries that cannot be crossed
	Conflicts of interest
	Promote flexibility or rigidity
	Enable/constrain further core activities
Track record	Prior experience working at the interface and building partnerships
	Capabilities and competences important to the partnership

Source: Workshop presentations and breakout group discussions

3.4 Developing the value proposition: co-creation, alignment and mutual benefits

Developing win-win, mutually-beneficial partnerships, that are in line with each partner's mission and responsive to their needs, was considered to be key to the long-term success

"It is absolutely key that you get a clear articulation of the goals at the outset. ... And not only that, inside the company, you have to get that sponsored, networked and secure buy-in across multiple divisions of the company."

Company executive

of strategic partnerships. Without this, the partnership can be reduced to a sub-contractor relationship between buyer and supplier. It is not surprising, therefore, that this has become one of the most important criteria for initiating such partnerships.

Co-creation at the heart of developing the partnership

How, then, do potential partners develop value propositions that deliver sufficient value for each partner? The core issue discussed was the importance of co-development at all stages of the partnership formation process: from working together as equals to identify the problems and challenges to focus on, to co-developing a joint vision, approach and operational plans. Partnerships should also go beyond specific, project-level problems to identify broader challenge areas that can provide a focal point around which activities are developed.

Developing a mutual understanding of needs, capabilities and contexts

'Softer' capabilities and relationship skills were seen as providing an important complement to the various processes and tools used to help develop the value proposition. Taking time to listen, explore and understand each other was seen as a critical part of initiating successful partnerships. At its core this approach involves developing a mutual understanding of each partner's needs, objectives and motivations for engaging in the partnership; organisational contexts and drivers; capabilities and competencies; and, importantly, constraints. This helps to ensure the objectives and activities of the partnership align with the missions of quite diverse types of organisations, while at the same time developing an awareness of the constraints that will need to be overcome to work together effectively. It also helps to ensure needs are aligned with capabilities, for both parties.

This process is complicated by the potentially diverse sets of interests and objectives that can exist amongst the different stakeholders that could benefit from being involved in the partnership, even within the same organisation. For example, there can be differences between the interests of the leadership of the university and individual academics; and between central R&D, business units and human resources within a firm. It is within this type of complex context that value propositions are often developed and attempts must be made to take these complexities into account.

Open, honest and inclusive dialogue between the partners involved, and at different levels of the partners' stakeholders (e.g. strategic and technical), was thought to be important in aiding this process. It can help to reveal some of the hardest industrial challenges that need to be solved in order to develop the technologies, products and services of the future, and which require advances in fundamental and applied science. Such dialogue can help to redefine industrial challenges and reveal new avenues for exploring potentially disruptive solutions. It can also be important in helping to reveal how best to leverage each other's resources, capabilities and competencies, to deliver value for each partner. In addition, these discussions can help to identify wider opportunities for value creation that build on the initial core focus of the partnership, whether it be research, workforce development or something else. An inclusive process for developing the value proposition, involving different stakeholders from across the university and firm, can also be important to help build buy-in and commitment amongst these groups.

Alignment, managing expectations and the importance of clarity

Another key factor for the development of successful and sustainable strategic partnerships is the need to ensure objectives and interests are aligned, at different levels from strategic to operational. Expectations also need to be aligned, for example regarding timescales for deliverables,

the personnel to be involved and the potential for leverage. Expectations must be proactively managed to ensure that partners do not overpromise and underdeliver. This applies to both universities and firms.

Critical to this is a strong, open and honest dialogue between potential partners with the aim of developing realistic, and yet ambitious expectations. In addition, clarity is very important for communicating the purpose of the partnership to others, as well as for secure buy-in and to provide a well understood, commonly accepted point of reference to which partners can return in the event of disruptions or dispute.

Developing frameworks for exploring the value proposition

Some universities and firms have developed or adopted explicit frameworks that seek to reveal different types of partnerships and/or the areas of value that they generate. Others, while not making the process explicit, have attempted to develop a better understanding of the value proposition.

Such frameworks can provide an important structure within which to explore ways in which the potential partnership might contribute to innovation activity within the firm and across the university's wider research, education and knowledge transfer activity, as well as how this might vary for different constituencies within the organisation. A framework can help structure discussions within the organisation and prompt those with less experience of working across the university-industry interface to think about how such partnerships might contribute to other areas, beyond the well known, accepted ones (e.g. research and recruitment).

Endorsement of these frameworks by the organisation's leaders can give legitimacy to this type of activity, providing a method for communicating the value proposition to others within the organisation.

However, there were also words of caution concerning too rigid use of frameworks. Emerging strategic partnerships may find areas of value and roles that fall outside the existing framework and these should be accommodated. It is therefore important for such frameworks not to impose unnecessary or overly rigid boundaries on the discussions, but rather to act as enablers to stimulate ideas. Similarly, they can provide a powerful method for helping to define the ambitions of a partnership (e.g. encompassing different areas of value), but should not be taken as a prescriptive 'check-list' to which all partnerships are expected to conform. They may need to be periodically refreshed based on internal and external learning and effective practice.

Other mechanisms supporting the development of the value proposition

Other mechanisms identified for exploring and developing the value proposition include:

- » Revealing strategies and innovation/technology roadmaps (often subject to confidentiality agreements) can help to identify challenges and areas of focus for the partnership

- » Joint partnership roadmapping can provide a systematic and inclusive structure for bringing together people from each organisation to explore the value proposition, and ways in which the organisations could work together
- » Strategic partnership workshops can allow a variety of stakeholders from each organisation to present and explore ways in which their interests, needs and capabilities can be matched and developed. This can also help to stimulate connections at an individual level between academics and their industrial counterparts

Delegates also examined the challenge of identifying value opportunities for collaborations between a university and its academics in different disciplines, and the diverse range of stakeholders that exist within a firm. Typically there are few, if any, individuals within a company who are aware of the full range of activities taking place in a given university. There was a consensus that trying to disseminate information by email often results in information overload. Potential alternative mechanisms included:

- » Individuals, skilled in spanning internal and external boundaries, networking across the university-industry interface and within each organisation, to identify needs and challenges, filtering out discrete opportunities to be distributed within the organisations
- » Sending out 'postcards' or newsletters to staff with a basic outline of what is going on within key universities. This has provided good results in terms of soliciting ideas and opportunities
- » 'Speed dating' methods, bringing together different business units with the university to identify and explore needs and possible opportunities. These had been explored by a number of firms attending the workshop. However, while they were seen to be potentially valuable, success was critically dependent on having the right people involved
- » Self-selecting mailing lists allowing people to opt-in to learn more about specific topics they find interesting

3.5 Securing commitment and buy-in

Developing a mutually-beneficial, clear and well-aligned value proposition is just part of the challenge involved in setting up a strategic partnership. Given the strategic importance of these types of partnerships, securing commitment and buy-in is critical for success. Successful partnerships require commitment and buy-in not just from the senior leaders and key decision makers within target business units, but also from those that will be involved at the coalface.

Workshop delegates argued that the greater the number of individuals committed to a partnership, the greater the resilience there would be to change. In addition, securing commitment and buy-in can often require engaging with a range of internal stakeholders, with different strategic roles and positions within the organisation and with varying objectives, budgets and power dynamics. Navigating the complexity of firms and universities to achieve buy-in is therefore incredibly challenging and can be resource-

intensive. It is also a continuous process that does not finish once the strategic partnership has been established, but rather is ongoing throughout the partnership's life.

Commitment and buy-in at appropriate levels of seniority

Many people often talk about the need to secure commitment and buy-in from the leadership of each organisation as an important condition for developing successful UISPs. Long-term commitments help to provide greater certainty that the necessary resources will be allocated to make the partnership work. In addition, if a UISP acquires institutional importance it helps to focus the negotiations and empower those involved in its initiation to resolve internal conflicts and overcome obstacles.

Clarity of purpose was seen by delegates as absolutely critical for the process of securing commitment and buy-in: what is the value proposition and how is it going to support my core activities within the firm? A key challenge is that the nature of the value proposition, and how it is best communicated, may well vary between different parts of the firm. Selling the proposed UISP internally may therefore require various approaches to take these internal differences into account.

In addition, the delegates were clear that firms – in the same way as government research funders – increasingly need to understand how they will realise value from their investments. Having clear transition pathways and processes for channelling the outputs from the UISP back into different parts of the firm was thought to be an important part of the process of securing commitment and buy-in.

The workshop also revealed that there was a need to operate at appropriate levels of seniority within each organisation, focusing on those individuals who could influence current and future decisions relating to the partnership and commit the necessary resources. For example, depending on the structure of the university and the ability of senior leaders to direct academic activity, it may not always be necessary or very effective to involve the Vice Chancellor. Instead, it could be better to focus on securing the commitment of a head of department or school. Within large firms, commitment to long-term strategic partnerships often has to be endorsed at senior management level and increasingly benefits from, or even requires, buy-in from those business units that would be involved in the successful absorption of the partnership outputs back into the firm and their impact on frontline products and/or services.

Understanding and navigating internal power structures

The complexity of large organisations, and the internal politics that often exists within them, places particular importance on involving individuals who understand the internal structures, processes and power dynamics involved in the initial stages of the strategic partnership. These individuals have to understand the needs and goals of the different groups involved and how the partnership might contribute to their activities; be well-networked within their own organisations;

be able to navigate the internal complexities and power dynamics of their organisations; and be able to understand both the formal and informal processes for securing resources and commitment for major external investment in the university base. These individuals can also help to identify any 'trip wires' that could derail the process, ensuring the partnership emerges successfully.

"You can have brilliant scientists and fantastic researchers who don't understand their own organisational politics and although they want to deliver things, they don't know how to get past the bureaucratic blockages of their own organisation."

UK university leader

Securing commitment and buy-in on the ground

While securing commitment and buy-in at the decision-making level of the university and the company is important for initiating a successful strategic partnership, without the interest, willingness and desire of academics and industrial staff to become involved, the partnership is likely fail.

It has been often noted that it is not easy for leaders to direct academics in many research-intensive universities. Any decision to form a strategic partnership should therefore actively consider why academics would want to become engaged in the partnership and how the proposed partnership might support their current and future personal career interests. Some delegates noted that the nature of long-term strategic partnerships can make the 'sell' to academics easier, particularly when the partnerships focus on addressing the longer-term, most challenging issues for companies and industries which require advances in fundamental and applied science, and big, 'audacious' goals. In addition, including academics in the partnership formation process can help to align interests, ensuring mutual value for both sides and at all levels.

The workshop also revealed that these points apply equally to researchers in large firms. In the same way as academics, many researchers in large firms do not like being told who they should work with. Participating in strategic partnerships needs to benefit individuals on both sides, either personally or professionally. Any decision to form a strategic partnership needs to consider whether the balance of incentives facing staff is conducive to such activity.

"Much like the professors, our researchers don't like being told where to go and what to do."

Company executive

Well-networked boundary spanners

Well-networked intermediaries who have the capability and resources to engage across the university-industry interface (exploring opportunities, facilitating links, supporting the development of the value proposition), as well as internally within their own organisation (e.g. across business units, central R&D, HR and manufacturing divisions within the firm), were also thought to be very important for facilitating the process of securing commitment and buy-in. Particularly important was the ability to understand the internal politics of their own organisations and hence know both who to engage with, and how best to engage to get things done.

These individuals need to be able to reach out to various constituencies across the organisation, to understand and distil ways in which these groups might benefit from the partnership, and what capabilities and constraints they face in order to engage with it effectively. In addition they need strong communication skills to be able to clearly articulate the value proposition, depending on the type of audience they are engaging with. However, given the potential for many possible connections to develop between a firm and a university, these individuals also have to be able to act strategically and to reflect on which connections are the most important to develop and strengthen.

There was also consensus at the workshop that although these types of individuals are incredibly valuable for building an effective strategic partnership, they are in short supply.

3.6 Developing agreements: negotiations, IP and framework agreements

The formation of strategic partnerships increasingly involves the development of an overarching framework agreement. These are typically negotiated up front and can require a great deal of resources. If developed appropriately and successfully, they should reduce the transaction costs of engaging over the longer term. However, the existence of a framework agreement will in no way guarantee a successful partnership. If other conditions are not met – in particular the alignment of mutual interests and benefits and the commitment of both organisations at various levels – the partnership is likely to flounder.

In addition, as will be discussed later in this report, partnerships need to be able to adapt and change in order to survive. Framework agreements should be developed to foster a culture of continuous learning within the partnership and allow it to adapt, rather than create structures that are too rigid and inflexible and impede change. Examples were given in which the initial conditions of the partnership constrained adaptability rather than enabling it (for example, overly rigid setting of outputs and milestones with little room for change).

Despite many advances in the scale and quality of university-industry collaborations over the past decade, there are still enduring concerns around how long it takes to put a framework agreement in place and the delays this creates in

getting the partnership up and running. There was, however, a sense that the quality of negotiations, in particular around IP, has improved in recent years, with a growing recognition and understanding of the IP-related constraints each partner faces. Difficulties still remain, not least when IP approaches, which have been developed for particular sectors (e.g. pharmaceuticals), are then applied, without much thought, to other sectors with very different innovation processes and lifecycles (such as aerospace or the financial sector). In such cases, it may not be possible to easily transfer terms and conditions (e.g. concerning IP royalties) and new approaches to value appropriation may be required. Negotiations may also need to address other issues such as data security, with implications for how the partners can work effectively together.

“Need to look at different models to value IP ... what is the value of emerging IP [from universities] and how can we get the technologies that come out of the university into practical use, because that is what it is really about.”

US university leader

The workshop breakout group on agreements, negotiations and IP identified five key effective practices:

- » **Get the hard stuff on the table first:** establish any clear non negotiables, so that everyone knows where they are starting from
- » **Have the decision maker in the room for IP negotiations:** it is very helpful if the person who understands how the decision is going to be made, and can make the decision, is present
- » **Make sure that you have buy-in at all necessary levels** so that you can strike the deal
- » **Establish a basic outline of the agreement upfront** i.e. a framework you are going to use to agree terms
- » **Sometimes it is important just to get a project started** and have it successfully completed. This very often leads to bigger and better strategic collaborations

Table 3 provides a more comprehensive list of practices suggested at the workshop for approaching negotiations and the development of strategic partnerships.

3.7 Financial and resource commitments

The scale of resources committed – both financial and non-financial – can provide important evidence of the degree of commitment and buy-in by key stakeholders in the partnership, not least the partners’ leaders. In addition, funding sources also matter: are the various stakeholders committing their own funds or primarily seeking other sources of funding, for example from public programmes? Company delegates noted that it was becoming increasingly

necessary to secure resource commitments from business units, not least to ensure that interests are aligned, strong exploitation pathways are created, and those that are expected to exploit the outputs of the partnership are engaged and committed to its success by having ‘skin in the game’. However, a potential downside is the increased vulnerability of budgets to changing the short-term needs of business units, particularly if the strategic partnership is focusing on long-term capability and competence building rather than short-term problem solving.

Moving beyond contractual relationships to strategic partnerships also implies a mutual commitment of resources on both sides to develop the partnership, helping each side to leverage their resources more effectively.

However, developing effective, university-industry strategic partnerships is not all about money. Indeed, money is often the last thing that determines the long-term success of a strategic partnership. What is important, is what the resources committed to the partnership help to enable – such as the development of close, trust-based relationships as well as increased capabilities and expertise to address challenges of mutual interest.

While non-financial resource commitments can be an important component of the contribution made by a partner to the relationship (e.g. transfer of materials, access to databases, provision of equipment) a realistic assessment needs to be made of the financial resources required to develop the partnership and to deliver the expected outputs, and how these will be funded. Delegates at the workshop noted a wariness of too much reliance on in-kind contributions from academics, given the ease with which these commitments can be made and the difficulty of securing time from academics in the face of other funded activity. Financial commitments provide a degree of comfort and commitment that the promised contributions will be delivered.

Finally, attention needs to be given to the profile for ramping up resource commitments. Too much money too quickly can cause problems and lead to overpromising and underdelivery in the critical early phases of the partnership. This can result in bad experiences which could harm the sustainability of the partnership and damage both individual and institutional reputations.

3.8 Flexibility

Those most successful and enduring partnerships are those that can adapt and change. Building flexibility into the partnership from the outset was therefore seen as important. This allows partnerships to respond to, rather than be constrained by, changing internal and external factors (see later in the report for more details) as well as to build understanding of what works best in order to realise value from partnerships. However, there was also a feeling that this needed to work in both directions: universities and the academics involved, as well as those within companies, need

Table 3: Effective practices for approaching negotiations

Issue	Details
Understand case specifics	What each party is willing to commit to, and expectations for deliverables and timescales Try to understand the wider circumstances of the partnership
Build up to a detailed framework agreement	Sometimes it can be difficult to define a detailed framework agreement at the start so begin with a general expression of interest and build from there Framework agreements can take time to put in place. Sometimes getting a project started and working well can be invaluable for developing an impetus to complete a wider framework agreement, and demonstrate the potential value of a partnership for both sides. Such pilot projects, if successful, can lead to longer, more effective partnerships
Establish non-negotiables	Each party should be allowed to put non-negotiables on the table at the outset to establish clear boundaries and lines that cannot be crossed (e.g. the right of students to publish in many universities)
Contract flexibility	Developing the agreement can require flexibility and creativity on both sides, coupled with a willingness to find workable solutions for the inevitable problems Be willing to co-develop mechanisms, to manage expectations and to mitigate any potentially negative outcomes
Clear expectations	Establish clear expectations from all parties going into a relationship
Clear resource commitments	Clear budget and commitment of resources Be realistic about phasing of funding and establishing suitable ramp-up periods to prevent overpromising and underdelivery in the early phases of the partnership
Invest time to ensure alignment	Align the business cases of both the university and the company to effectively align expectations for IP agreements
Negotiating IP	IP should be dealt with upfront and adopt a nuanced understanding of where IP lies, how it varies by type of activity, and how big any IP issues are. IP conditions are likely to vary for different types of activity within the partnership (e.g. basic research vs applied vs testing; projects involving students) There may be important differences across sectors which make standard IP terms inappropriate and hard to transfer Be clear about which issues arising from negotiations are IP-related and which are not – sometimes non-IP issues can get lumped into discussions about IP and should be dealt with in another context Understand what background IP exists and what foreground IP you expect to generate Deal with take-back rights/hand-back rights/retaining rights by the university in the negotiations
Consider effects on core university activities	Be aware of, and clear about, any terms that might affect academic careers or student activity (e.g. a student's ownership of IP arising from theses in many universities)
Encourage learning and partnership adaptability	Learning and adaptability were seen as critical to the success of strategic partnerships. Any agreements should seek to foster a culture of continuous learning and enable adaptation in the face of change
Focus on dialogue and reconciliation	Build dialogue and reconciliation into the contract mechanisms, in case of adverse events affecting the partnership, in order to avoid conflict
Project termination/partnership exit strategies	Clarity on how projects within the partnership will be terminated Clear strategies for exiting the partnership, potentially including wind-down/termination periods to minimise disruption for both partners (e.g. for PhDs or post-docs)
Have decision makers in the room/empowerment	University leaders need to be clear about their vision and philosophy regarding university-industry partnerships and, in particular, what they expect from strategic relationships Empowerment of those involved in the decision-making process is important, within a clearly established vision and philosophy, not least to enable those negotiating to work through problems and make tough choices/trade-offs
Do not get distracted by press releases and MoUs	Do not let the delivery of press releases and the signing of Memorandums of Understanding overshadow the importance of initiating the first project
Do not be afraid of failure	If terms cannot be agreed, do not be afraid of walking away, but do so as friends – other opportunities may arise in the future and both universities and companies have long institutional memories

Source: Workshop presentations and breakout group discussions

to be aware of, and responsive to, each other's changing needs and priorities.

For example, delegates noted that while the vision and high-level strategic objectives for the partnership might be clear, this might not be the case for the detailed programme of

activities. There were examples in which the most productive lines of research only became clear as a result of close interaction and dialogue, once the partnership had been established. The dialogue helped the industrial partner to redefine its problems at a more fundamental level offering the potential to create more disruptive outcomes.

Building in flexibility can create challenges for securing buy-in and commitment. Senior management and legal teams may prefer tightly-specified contracts, with clearly specified milestones, to more open-ended partnerships with high-level objectives but flexible research plans. Strong communication, both between partners and within each organisation, articulating a clear value proposition with strong management and governance systems in place (e.g. for selecting projects, managing the research and reviewing progress, with clear processes for terminating projects if required) can help to overcome these challenges. Similarly, building in times to revisit the vision and the strategic plan can also help to ensure that the partnership adapts to changing needs and conditions.

4 Nurturing and managing strategic partnerships

Once established, long-term strategic partnerships need to be proactively nurtured and managed. This can be resource intensive and should be anticipated during the initiation and planning phases. In addition, the challenges faced by the partnership can change after it has been established and is moving through the early development phase and into maturity (for the early development phase see Table 4 and for the maturing phase see Table 5).

While there are many similarities between company and university viewpoints, some key differences emerged concerning challenges during the early development phase.

The universities highlighted a lack of commitment by their organisation's leadership, a lack of connections and points of contact between the partners, and difficulties and inflexibility in adapting the partnership. Conversely, firms identified governance and management structures, difficulties in accessing expertise from across the university, and integrating the partnership into the wider organisation as particularly pressing challenges.

As partnerships mature, their challenges change once again. Accessing the wider expertise of the university becomes the most frequent challenge for firms with a lack of commitment

Table 4: Top ten challenges identified by universities and firms for the early development phase

Top ten challenges during early development					
University perspective			Firm perspective		
Uni rank	Description	Firm rank	Firm rank	Description	Uni rank
=1	Expectations for timescales, outputs and value unrealistic	=1	=1	Misalignment of objectives and motivations	=4
=1	Lack of clarity concerning objectives, roles and tasks	=1	=1	Expectations for timescales, outputs and value unrealistic	=1
3	Capacity constraints for research staff from non-partnership duties	=6	=1	Lack of clarity concerning objectives, roles and tasks	=1
=4	Organisation's leadership not fully committed	12	4	Trust not developed between partners	=4
=4	Partnership interface (working practices, culture, communication) not efficient or effective	=6	5	Governance and management structures inadequate	=15
=4	Trust not developed between partners	4	=6	Accessing wider expertise of organisation too difficult	13
=4	Misalignment of objectives and motivations	=1	=6	Capabilities and resources for partnership support (e.g. project management, commercialisation, admin) insufficient	=10
=8	Institution-level connections/points of contact inadequate	=16	=6	Lack of experience in developing and managing partnerships	=10
=8	Difficulties/inflexibility in adapting partnership structure and objectives	=16	=6	Partnership interface (working practices, culture, communication) not efficient or effective	4
=10	Capabilities and resources for partnership support (e.g. project management, commercialisation, admin) insufficient	=6	=6	Capacity constraints for research staff from non-partnership duties	3
=10	Contract and IP negotiation process: obstacles and timescale issues	=16	=6	Integrating partnership into existing organisation ineffective	=15
=10	Lack of experience in developing and managing partnerships	=6			

Number of respondents: universities (31); firms (13)

Shading represents points of difference between universities and firms

Source: CSTI strategic partnerships workshop survey 2014

Table 5: Top ten challenges identified by universities and firms in the maturing phase

Top ten challenges during the maturing phase					
University perspective			Firm perspective		
Uni rank	Description	Firm rank	Firm rank	Description	Uni rank
1	Capacity constraints on research staff from non-partnership duties	=6	=1	Accessing wider expertise of organisation too difficult	=3
2	Capabilities and resources of partnership support (e.g. project management, commercialisation, admin) insufficient	3	=1	Organisation's leadership not fully committed	=3
=3	Organisation's leadership not fully committed	=1	3	Capabilities and resources of partnership support (e.g. project management, commercialisation, admin) insufficient	2
=3	Partnership interface (working practices, culture, communication) not efficient or effective	=6	=4	Trust not developed between partners	13
=3	Accessing wider expertise of organisation too difficult	=1	=4	Lack of experience in developing and managing partnerships	17
=6	Expectations for timescales, outputs and value unrealistic	=6	=6	Misalignment of objectives and motivations	14
=6	Integrating partnership into existing organisation ineffective	=12	=6	Expectations for timescales, outputs and value unrealistic	6
=8	Institution-level connections/points of contact inadequate	19	=6	Partnership interface (working practices, culture, communication) not efficient or effective	=3
=8	Difficulties/inflexibility in adapting partnership structure and objectives	=6	=6	Capacity constraints on research staff from non-partnership duties	1
=8	Major industrial competitors form links with same university	=12	=6	Internal bureaucracy of organisation gets in the way	14
			=6	Difficulties/inflexibility in adapting partnership structure and objectives	8

Number of respondents: universities (31); firms (13).

Shading represents points of difference between universities and firms.

Source: CSTI strategic partnerships workshop survey 2014

by leadership also important. Trust continues to be an issue. For universities, the capabilities and resources required to support the partnership are cited more frequently than in the early days, while capacity constraints, lack of leadership commitment, the partnership interface, and inflexibility of the partnership structures and objectives continue to be important challenges.

This section presents the workshop discussions and deliberations on lessons and effective practices for nurturing and managing strategic partnerships once they have been initiated. Delegates discussed issues relating to partnership leadership, management and governance; the importance of boundary-spanning functions and individuals with the capability, time and resources to perform this role; the importance of partnership-building capabilities; building trust and creating an institutional memory; the importance of openness and communication; strengthening and multiplying partnership nodes and linkages; accessing and leveraging the wider knowledge base of each partner; and the importance of thinking about how each partner will absorb and exploit the outputs.

4.1 Partnership leadership, management and governance

Strategic partnerships often require dedicated leadership and management with responsibilities allocated for developing, coordinating and directing the partnership at an institutional level, to ensure that vision and objectives are delivered, and the relationship is guided through turbulent times. In addition, evidence emerged that one partner's leaders can help the other partner manage its internal politics, for example by providing evidence of value and by exerting external pressure should internal delays or barriers hamper the development of the partnership.

"Probably the single most important reason for success is the leadership. ... Without their commitment and dedication and continual refinement of the programme, this would not have been the success that it has been."

US university leader

Selecting partnership leaders

The workshop identified a number of key characteristics when selecting partnership leaders, including:

- » **Resource and time availability.** Leading and managing large strategic partnerships is time consuming, whereas senior academics and senior company managers are notoriously time poor. Incentives therefore need to be aligned internally to ensure that partnership activities are seen as a core component of a leader's workload, rather than a marginal activity
- » **Strength of networks and linkages** within their own organisation both with senior leadership, and with other constituencies, as well as an ability to develop relationships and communicate effectively across the university-industry interface
- » **An understanding of the internal politics of their organisations** and how to navigate bureaucracy without setting of explicit or implicit trip wires that could derail the partnership
- » **Experience of developing and managing university-industry collaborative projects** and the ability to bring together individuals, expertise and resources from around the organisation, fostering a collaborative working culture and environment for the partnership
- » **Experience and capabilities** for handling and managing conflict

Advocates and champions

Workshop delegates also highlighted the importance of building linkages between partners and putting in place advocates and champions. This is typically discussed in terms of securing executive sponsorship (e.g. the University Pro Vice Chancellor for Research or the company's Vice President for R&D) to ensure senior-level commitment and championship. These linkages can also be important for helping to overcome barriers impeding the partnership's development. However, the workshop also found that key linkages are valuable at multiple levels, going well beyond the executive level to include, for example, interactions between heads of department and R&D directors/managers, and between key principal investigators.

Strong, inclusive and accountable partnership governance

In terms of partnership governance, the workshop identified the need to give thought to:

- » **The balance of representation** from each party on governing and management boards, and the balance of decision-making powers for strategic direction, project focus and selection
- » **The inclusion of wider stakeholders** from within the university and from target user communities across the firm (e.g. business units, manufacturing, HR etc.) on the steering group. This can support the development of the partnership and strengthen the involvement of, and build active channels to, target users across the firm

- » **The approval process for project selection** and who should be involved (e.g. jointly based on mutually-accepted decisions; peer review; firm only; university only)
- » **Veto powers by either partner.** Consideration needs to be given to how any power of veto will affect partnership development as well as the perceived legitimacy of the partnership and the willingness of academics, in particular, to become involved. There are examples of successful, major strategies that have been shaped jointly but without any line-item veto.

As part of the partnership governance discussions, the importance of regular (often annual), formal reviews emerged, in addition to more regular meetings at both the strategic and operational levels of the partnership. However, these can, and should, go beyond reporting on progress towards achieving objectives and key performance indicators. While these are important, not least to provide evidence that the partnership is on track and delivering value to each organisation, such reviews can also provide an important forum for reflecting on any learning over the previous year (for example what is, or is not, working at the partnership interface to realise value from the activity) and can help to identify ways in which the partnership needs to adapt. They can also provide a venue for effective practices developed elsewhere to be introduced and, if necessary incorporated, into the operation of the partnership.

Some delegates talked about the value of having informal updates between the university and company teams in advance of the formal annual review. This can help ensure that:

- » Any 'surprises' are identified in advance and can be dealt with prior to the review
- » Messages are developed, shaped and presented in such a way as to deliver the strongest case to senior executives concerning the value of the partnership
- » Any 'language' differences (e.g. in terminology) are minimised and overcome, ensuring that the evidence presented can be easily understood by key stakeholders within the firm, who may not necessarily be used to engaging with academia

4.2 Capabilities and support for building partnership development

In addition to the academic expertise and knowledge required to deliver the partnership projects, the workshop identified a distinct need to strengthen the wider set of capabilities for building and nurturing partnerships. These included:

- » Strengthen interpersonal and relationship-building skills on both sides to support effective working at the interface. While important during all phases of partnership development, it was seen as particularly important during initiation and the early phases. First impressions matter to both firms and universities and bad initial experiences can irreparably damage the potential for developing a UISP.

More thought therefore needs to be given to the choice of individuals involved in the initial contacts and negotiations to ensure the greatest chances of success

- » Develop greater boundary-spanning skills to enable individuals to work more effectively at, and across, the different interfaces, both within the partnership and internally within their own organisations
- » Greater understanding of each others' cultures, objectives, constraints and contexts
- » Partnership leaders need to have the status and respect of their peers within their respective organisations and have the ability to get people to work together. UISPs are typically interdisciplinary and benefit from individuals willing to work across disciplinary boundaries and, increasingly in the future, across organisations.

"This is about people... it is not about corporate policy ... We need individuals who can understand our own organisations and span across boundaries."

UK university leader

There were calls for developing 'T-shaped' people, building on the IBM concept that individuals should have in-depth capabilities in particular areas, complemented by a wider range of capabilities that enable them to identify contextual linkages and participate effectively in interdisciplinary teams¹. Indeed, given the potentially complex nature of UISPs, there were suggestions that individuals may require deep capabilities in a number of areas as well as a broader understanding, extending 'T-shaped' individuals to become what delegates described as 'II-shaped'.

In addition, broader, university-based partnership support can:

- » Provide an interpretive function to help universities and their academics understand the needs of industry, potential industrial applications for their research, and ways in which research programmes can be shaped, and collaborations developed, to address industrial needs
- » Provide a university-wide perspective to bring together the range of expertise and resources required to address these often interdisciplinary challenges
- » Work with academics and industrial partners to help them understand and develop the partnership value proposition and the capabilities and competences that each side can bring
- » Help the company understand its motivations and expectations for working with the university and explore how these can be developed in productive ways

- » Facilitate connections between the firm and other firms interacting with the university with non-competing, yet complementary, interests

4.3 Strengthening absorptive capacity

The challenge of realising value from innovation-related investments, external to the firm, is well known and relates to what is usually termed 'absorptive capacity': the ability of the firm to identify and acquire external knowledge; to analyse and process this knowledge; to transform it; and ultimately to exploit it within its own operations². Quite simply, if partners struggle to absorb the outputs from the strategic partnership, the realised value will inevitably be limited.

Discussions at the workshop suggested that successful strategic partnerships have the potential to increase the ability of each partner to realise benefits from their investments in the relationship, compared to other kinds of partnerships. However, they noted that this is dependent on their ability and willingness to learn and adapt, and takes time: partners may not be fully aware at the outset of the partnership how best to work across the interface; how to design projects that most effectively address company challenges; and how best to develop project outputs that can be assimilated, transformed and exploited by the firm to contribute to their innovation and production activities. Examples were provided in which, at the outset of a major partnership, outputs were structured in line with previous experiences of working with other firms and pre-existing perceptions of 'what works'. However, the firm found it challenging to absorb these outputs. The partnership learned to adapt its behaviour and structure outputs into larger packages that could be absorbed more easily. Importantly, this learning process may also provide a better understanding of which other internal or external stakeholders need to be brought into the process – whether at the project inception stage, throughout the process, or for output production – to maximise the potential for outputs to be of value to the firm.

The workshop suggested a number of mechanisms that could help the industrial partner to better absorb outputs from the UISP, enabling them to realise greater value:

- » Work together as partners to understand each others' capabilities and internal constraints and be willing to learn from what works and does not work in terms of transferring outputs across the interface and back into the firm

"We couldn't deliver them bite-sized innovation; they didn't know how to receive it. So we had to learn how to package ideas into technology packages."

US university leader

1 http://www-05.ibm.com/de/ibm/engagement/university_relations/pdf/Beyond_IT_report_IBM_Workforce_of_the_Future.pdf

2 Zahra, S.A., George, G. (2002) "Absorptive Capacity: A Review, Reconceptualization, and Extension", *Academy of Management Review*, Vol. 27(20), pp. 185-203

- » Do not be constrained by the original plan and be willing to adapt if new avenues emerge or serendipitous events mean that the partnership needs to change
- » Co-location can help, not least because it promotes strong, frequent communication. There was a view that this type of partnership was very much a 'contact sport' and it was hard to replace face-to-face meetings with other ways of working. This implied that there would be benefits from visiting each others' sites if partners were not co-located. It was therefore important to provide suitable spaces and design structures that facilitate both co-location and the movement of people
- » Encourage the movement of people at different levels, not just students. Internships, staff exchanges and secondments in both directions can all facilitate the transfer of outputs, while also increasing understanding of how transfer processes might be improved. For example, there were discussions about whether PhD students working on partnership projects could be encouraged/incentivised to spend time transferring outputs into the firm at the end of their doctoral programme (for example, between completion and their viva)
- » Understand company and industry standards and protocols and work to align outputs with these
- » Reflect on the staff capabilities necessary on both sides to address/overcome challenges at all stages of the absorptive capacity process (from shaping the projects, to collaborating during the project, to developing and transferring the outputs). Exposing staff, during the early phases of the partnership, to the internal working environments of each partner can not only help to build relationships but also develops staff understanding of what does and does not work.

4.4 Building boundary-spanning functions for partnership development

The importance of boundary-spanning functions kept emerging throughout the workshop. As discussed earlier, universities and multinational firms are often large, complex organisations with many different internal stakeholders and groups (different business units, central R&D, HR, manufacturing plants etc.). As such, developing partnerships between them can be difficult, requiring connections to be made between multiple groups in the firm and in different parts of the university, each of which may have different objectives, capabilities, constraints and working practices. These connections provide important channels along which information can flow between the target user groups within the firm and the strategic partnership. They can also help to shape the direction of research and the format of the outputs, and provide the necessary channels through which the outputs flow back into the firm, to their intended target user. Developing and nurturing these connections involves operating across multiple interfaces, both between the university and the firm, and internally within each organisation. There was a view

"You can't have a conversation with [the company]. It isn't a thing; it isn't a person; it isn't monolithic. You have many different businesses inside it and it is absolutely essential in this sort of thing to have an onsite person who actually mines the constituencies back [within the company]."

US university leader

at the workshop that both universities and large firms could coordinate their internal organisations better when it comes to partnership formation and development. It was also thought that customer relationship management packages did not work very well in these circumstances.

To help alleviate these 'boundary-spanning' challenges within strategic partnerships, the workshop emphasised the value of having individuals, both within universities and firms, with dedicated time and resources to work across boundaries and develop networks, both internally and with the strategic partner organisation. Such boundary-spanning individuals were seen to make valuable contributions to partnership development at all stages of the process, from initiation to nurturing and development, to sustaining it through periods of disruption. However, this function needs to complement, not be a substitute for, the building of academic-researcher relationships. Delegates also highlighted the importance of individuals not thinking they 'own' particular networks, and instead thinking in terms of greater collective ownership and sharing of contacts and linkages.

The workshop identified a variety of roles that this boundary-spanning function could play in supporting partnership development during its different phases:

- » **Formation** e.g. supporting contract/IP negotiations, developing the value proposition, securing buy-in and commitment from different internal stakeholders
- » **Early development** e.g. helping to refine the value proposition, supporting partnership learning during its infancy, sharing effective practices, and addressing any initial barriers
- » **Maturation** e.g. helping the partnership move beyond its current boundaries and explore new opportunities by connecting and engaging different parts of the university and/or firm
- » **Through disruptive periods** e.g. providing a dedicated resource to work through difficulties and a stable point of reference for discussions and negotiations when wider factors are changing
- » **Termination** e.g. helping to ensure that the partnership ends without harming the institutional reputations of either organisation

Discussions at the workshop also provided insights into the types of capabilities required by these boundary-spanning individuals. These included:

- » Sufficient experience of working in industry and the ability to help universities understand what industry needs, providing an important interpretive function
- » Credibility with academics, and the ability to help them shape a response to industrial challenges
- » Ability to support the building of collaborative, multi-disciplinary teams around industrial challenges
- » Strong internal networks and being politically aware. Examples were given of otherwise excellent academics and industrial researchers who did not understand their organisation's internal politics. Although they want to deliver things, they are not able to get past internal, bureaucratic obstacles
- » The power and influence to make things happen
- » The ability to cultivate commitment and buy-in from key internal decision makers, ensuring that if the partnership encounters obstacles, they know the right person with power and influence to overcome the difficulties
- » The ability to prioritise the best relationships to develop. There are a lot of potential connections that could be made between a university and a company, but establishing too many too quickly could result in available resources being spread too thinly

It was agreed that while it would be incredibly valuable to have individuals with these boundary-spanning capabilities, there was a shortage of people either able, or willing, to perform this function

4.5 Building trust and institutional reputation and the existence of blacklists

Trust was seen as essential for a successful strategic partnership. Strong, trust-based relationships were said to enable 'true partnership working', with partners able to share increasingly sensitive, core problems, ideas and information, in the knowledge that these would be treated appropriately in pursuit of a common goal. However, strategic partnerships require that trust is built not just between individual academics and industrial researchers but also at the institutional level, to ensure that the actions of small groups of individuals do not undermine the collective, institution-level relationship.

"You have to trust the partners you are working with, there has to be goodwill, there has to be the belief that both parties are working in good faith."

US university leader

Trust is a hard concept to define. However, it was recognised that building trust requires, in part:

- » Developing confidence that shared ideas and information will not leak out in unplanned or unintended ways
- » Both parties working in good faith and with goodwill
- » Ensuring that the actions of individuals within the organisation support the wider collective mission of building a successful partnership.

Building trust, particularly in the early phases when personal relationships are still being developed, may require each partner to send concrete signals to emphasise their strength of commitment and demonstrate that they can be trusted with their partner's ideas and information. Some examples of ways this could be achieved were highlighted by delegates, including: contractual commitments e.g. for data security; investing in appropriately secure data storage and handling processes; and a willingness to develop formal 'Chinese walls', particularly when competitors are working with the same university.

Trust takes time to build between individuals. However, it was argued that it takes even longer to build between institutions – and can just as quickly be destroyed. Repeated bad experiences, that are not addressed, can easily destroy trust built up over many years.

Company delegates were keen to point out that they have long institutional memories and that, once trust is destroyed, it can take a long time to recover. University delegates noted that this was equally true within their institutions, and the effects of a bad experience of working with a particular firm can linger for long periods. It also emerged that there is clear awareness within relevant social networks of those universities or firms that do not 'play nicely together'. This suggests that, either implicitly or even explicitly, blacklists exist. This implies that bad experiences on either side may not just affect the ability to rekindle the relationship sometime in the future, but may adversely affect other partnerships.

4.6 Partnership nodes, interactions, openness and communication

In addition to the critical importance of trust and personal relationships to the success of strategic partnerships, workshop delegates also highlighted a number of important, related factors that could help to strengthen these institution-level partnerships. These included:

- » **Openness, honesty and transparency between partners.** Follow a 'no-surprises' principle, minimising the possibility of misunderstandings between partners. This was seen as particularly important if partners were not co-located. If problems arise, focus on solving them rather than trying to attribute blame.

- » **Regular, frequent communication.** In strong partnerships, team members will probably touch base at least once a week, building a collaborative working relationship akin to one that would exist if they belonged to the same organisation.
- » **Building multiple linkages and nodes between partners** and increasing the density of connections. Strong, resilient, strategic partnerships go well beyond individual projects and people. There was a sense that the greater the number of nodes and the density of connections between partners, the more resilient the partnership would be. For example, it was argued that if you have many different constituent groups within each organisation forming multiple nodes and connections to work together at the interface, the demise of any single node would be unlikely to affect the overall strength of the partnership. Conversely, large partnerships (based on monetary value) that were, in reality, built around a very small number of individuals and projects, were thought to be vulnerable to change, not least if any of the key individuals moved on. Therefore, the strategy should be to grow both the breadth and depth of the partnership nodes. This is likely to require dedicated resources and strong boundary-spanning skills

4.7 People mobility

People mobility, some argued, was the sign of a very successful strategic partnership which has become truly embedded. In discussing this issue, delegates differentiated between endowed academic positions, which would persist regardless of whether the partnership was sustained, and the active movement of people at all levels across the boundary, spending time in each other's organisations. This does not necessarily mean being embedded for long periods in the partner organisation; it could be for shorter periods as and when needed, requiring a willingness to travel in both directions if not co-located.

There was a strong belief at the workshop of the value in fostering 'real' people exchanges between the partners, and that this should be done at all levels – from senior to more junior researchers. Delegates suggested that successful people mobility helped to:

- » Deepen the understanding of each other's needs, capabilities, contexts and constraints
- » Develop understanding of each other's working routines and co-develop/adapt routines for the partnership
- » Normalise communication practices and nuances in the 'language' used between partners
- » Develop capabilities for working across the interface by exposing individuals to the working environment of the other partner
- » Build social networks within the partner organisation to identify new opportunities and form new linkages. This can also facilitate the flow of knowledge to the partnership coalface helping to shape the research programme, and

helping partners understand how outputs need to be structured to ensure they can be absorbed effectively back into the firm

Despite the potential benefits of individuals actively moving between partner organisations, the workshop delegates found it difficult to implement in practice, particularly in the more scientific and technological disciplines. The delegates' experience also suggested that attempts to foster mobility at professorial level had been less successful than those exchanges facilitated at more junior levels. Concerns were raised about the effect on their careers, and on their position and influence within their peer networks, of spending time away from their own organisation. These concerns were reported equally by both universities and firms. There was also a perception that the UK was lagging behind other nations in this respect, with a belief that more people moved from industry into academia than the other way around. Similarly, it was lagging behind other European countries – such as the Netherlands and Germany – in terms of recognising the value of, and enabling, joint appointments, where individuals hold simultaneous positions in both academia and industry. The perception was that the US was a little more balanced in this respect, with individuals from industry moving both into academia and into government positions, before returning to industry.

Developing jobs embedded in both academia and industry

In addition, delegates argued for the need to stop viewing jobs as binary – either based in industry or within academia – and exploring the possibility and potential value of being embedded simultaneously in both worlds, with different degrees of emphasis depending on the circumstances and focus. In addition, they thought such arrangements should be flexible rather than static, changing as requirements and objectives change. There were also calls to further legitimise and reward this type of activity. Academics and industrial staff spending periods in industry or academia needs to be seen as a sign of excellence and career advancement, rather than of mediocrity and career damaging. Delegates suggested the situation has improved over the past 20 years but there was still a long way to go. It was also thought that the more senior members of staff follow such mixed mode careers, the more junior staff will perceive the value of this type of activity.

The underexploited potential of visiting industrial professorships

Visiting industrial professorship schemes within universities were also thought to strengthen the relationship between companies and universities. One of the companies present had a number of staff embedded part-time in universities as professors, spending the remaining part of their working week in the firm. However, these tended to be outside the UK and there was a feeling that the UK was missing out on a potentially valuable mechanism. There were also comments that, where these types of positions do exist in the UK, they can often be underexploited. There were suggestions that

universities did not want to overburden industrial staff. However, the industrial partners were often keen to contribute more and for the roles to be more than just nominal, although there were calls for universities to be much clearer about their expectations. It was also thought important that these visiting professors were seen as legitimate by other academics within the university.

Experiments underway to encourage people exchange

In addition to visiting industrial professorships, the workshop delegates identified a range of experiments underway to help foster people exchanges. These included:

- » Encouraging/facilitating PhD candidates who are working on partnership projects to undertake an internship at the firm between the submission of their thesis and its oral examination (viva). This was claimed to have been successful by those who had trialled it
- » It was believed that 'mixed mode' positions were becoming more popular in the US, with individuals dividing their time between industry and academia. However, the tenure system was perceived to be a barrier to this
- » The US has also seen a growing popularity and incidence of 'professors of practice' – in which individuals with significant, industry-leading expertise take on senior, often part-time but non-tenured positions within universities
- » Systematic involvement of student cohorts on industrially-sponsored projects. However, challenges around IP and student rights to publish needed to be addressed and can be particularly difficult if multiple organisations are involved in sponsoring the project. In some cases, the firms recognised that the cost of relinquishing ownership of IP was outweighed by the benefits of accessing fresh ideas and identifying excellent students to target for recruitment. It is of critical importance in these types of projects that students fully understand the conditions relating to any non-disclosure agreements. This may require additional support (including legal advice) to be provided by the university
- » Efforts to legitimise sabbaticals and time spent in industry by postdocs or other junior faculty by focusing on the skills and capabilities achieved and the value gained for their long term careers

4.8 Co-location and developing physical spaces for collaboration

Close geographic proximity – co-location – between strategic partners was thought to be important but not critical, for partnership success. The nature of co-location can take different forms, with examples including: dedicated desk/lab space within the university (which may or may not be in a secure, proprietary area); a joint facility housing both academics and company staff; a dedicated company facility on campus; or a company facility located near, but not on, the university campus.

The benefits of co-location identified by delegates included:

- » Providing a highly visible signal from each partner of their long-term, institution-wide commitment to developing the partnership
- » Helping each partner to identify, access and leverage the wider set of resources and knowledge to be found within each other's organisations
- » Reducing the challenges associated with managing and developing UISPs, with an emphasis on the value of frequent, face-to-face contact and the ease with which people can move between partner organisations
- » Strengthening the ability of partners to understand each other's needs, capabilities and constraints

In addition, becoming embedded on campus rather than co-located nearby, was thought to increase the chance of early access to the serendipitous discoveries and insights that may arise from research activity within the wider academic community, while also extending social interactions with key academics. It can also help to identify potential opportunities to work with specific individuals, which may not have been immediately obvious at the outset, creating new nodes and linkages between the partners.

However, co-location does not exist in every successful partnership, with examples cited of successful long-term partnerships that are not (currently) co-located. If partners believe in the relationship and its potential to generate value, they will find ways of working around the barriers and challenges introduced by operating at a geographical distance. However, if the partnership is facing other problems, geographical distance can potentially lead to neglect as those involved find other, more valuable activities to pursue.

Operating at a distance inevitably requires good communication facilities to be in place, including video- and teleconferencing. However, delegates suggested that this was not enough and should be coupled with rigorous working practices that enable a mix of structured, formal communications (e.g. planned monthly conference calls) and more informal communication. Indeed, it was claimed that some partners have reached a point where they do not go a week without speaking to each other, particularly at the technical/operational level. In addition, if partners are operating at a distance, the willingness and desire of individuals – at all levels – to travel to each other's sites appears to increase in importance. This acts both as a sign of the commitment between partners as well as facilitating the sharing of tacit and embodied knowledge that arises from face-to-face contact.

Co-location may also not necessarily occur at the outset, and may only result once certain threshold conditions have been met. These conditions could relate to the scale of activity, or to evidence of partnership success and long-term value, or the ability to work effectively together. Co-location may also form part of a company's broader strategy, for example, accessing or strengthening their presence in a particular geographic market.

4.9 Accessing and leveraging the wider knowledge base

The development of a strategic partnership makes it much easier to identify, access and leverage the wider set of capabilities, facilities and resources that are available within a partner organisation. UISPs help to reveal the hard-to-reach, 'hidden' parts of an organisation. Delegates suggested that while some parts of the UISP value proposition are well understood and well accepted (for example the benefits of engaging particular research capabilities in specific technological domains), there are other areas of potential value that are much less obvious or hidden, and that only reveal themselves once time and effort has been invested in developing the relationship and the networks between the organisations (e.g. certain datasets, software or techniques which are available in the wider organisation). In addition, there may be individuals who possess specific expertise, and who could make valuable inputs to the partnership, but who are not easily identified unless they become strongly embedded within academics' social networks. As such, some areas of value may only emerge over time as the UISP develops.

It was also argued that the ability to access and leverage certain types of resources – such as proprietary datasets and techniques – is contingent on both high degrees of trust, and on strong contracts. As such, certain types of objectives and value will only be possible once the UISP has developed and are not available at the outset.

However, there were big challenges in spreading partnership activities further into the partner organisations, not least the ability to manage information diffusion within large organisations and to engage with the different parts in order to identify the various needs, capabilities, resources, facilities etc. Attempts to do this can often lead to a significant volume of emails circulating and result in information overload. Delegates identified the following approaches:

- » Using newsletters, or other means, to send out key information about collaborations with strategic universities, in order to solicit interest from individuals and groups
- » Undertaking 'speed dating', whereby company staff and academics spend short periods of time together and outline their interests, capabilities and available resources in the hope of stimulating valuable connections. However, key limitations of this include the need to have the 'right' people in the room, and the ability of those involved to 'sell' their ideas in a way that is easily understood by the other person. Given the known communication barriers between academics and industrialists, valuable links may be missed, solely due to a lack of ability to communicate effectively in this type of pressurised context
- » Investigating the role of intermediaries and boundary-spanning individuals who have the resources and time to embed themselves in the various academic and industrial

networks and identify key needs, capabilities and resources and work to facilitate key linkages where necessary

- » Considering the value of joint appointments, with individuals simultaneously working for both partners, and with part of the role designed to support the development of the partnership
- » Setting up internships, placements and staff exchanges in both directions and at different levels (i.e. not just students, but also post docs and company staff)
- » Funding competitions to address particular challenges set by the firm or jointly with the university, soliciting proposals from academics across the university

In addition to tapping into the knowledge base within each other's organisation, some delegates also noted the benefits of accessing a partner's wider external networks. Anecdotal evidence emerged that firms have facilitated the bringing together of different universities and other relevant, innovation stakeholders (firm/non-firm) to generate critical mass around a complex industry challenge. They have also facilitated the emergence of global collaborations between universities. The reverse is also true, with academics facilitating new connections between two firms or between a firm and other universities, both within the same country and internationally. Indeed, the workshop delegates suggested that global spread had been facilitated by working initially with their partner's partner. The trust that existed between the two providing a basis for initiating the relationship.

5 Building resilience and dealing with disruption and change

Strategic partnerships – like most relationships between individuals and organisations – are not static, but rather evolve and adapt as they mature, learn, and face internal and external ‘shocks’ that disturb the status quo. While partnerships that are very stable and predictable benefit from the ability to set expectations and develop milestones, operational plans and performance metrics, they can easily be made irrelevant by changing internal and external factors. By contrast, flexibility enables partnerships to adapt to change but can introduce difficulties in specifying, with any degree of certainty, the key attributes of the relationship and the value proposition for anything other than the short-term. This can make it harder for individuals within the company to secure buy-in, and create difficulties for legal/contract teams. The open-ended nature of more flexible relationships also increases the importance of developing strong communication, both between partners and internally, to ensure that everyone is aware of the current state of development of the partnership and its direction of travel.

This section explores how partnerships change and the experiments and initiatives identified by workshop delegates for dealing with change and building resilience, including anticipating the future, and confronting either renewal or termination of the relationship.

5.1 Nature of disruptions and change

University-industry strategic partnerships are faced with a wide variety of changes, some of which can be potentially disruptive and lead to significant turbulence in the relationship. These changes can arise from within the firm; the university; the strategic partnership itself; the scientific and technical landscape; and the wider external socio-economic and political environment.

Changes arising within the company

- » The needs of a company can change, for example, due to changing or maturing technologies, products or services, changing industrial opportunities and challenges, or a refocusing of its strategic direction. These can change relatively quickly compared with the timescales typical of university research and result in partnerships undertaking activity that is no longer of significant value or relevance to the company
- » Organisational structures within the company can change resulting in key personnel moving on, power and budgets

shifting, and the location of activities changing. For example, R&D priorities can change from being driven by a central R&D unit to being driven by business units, which can alter the perceived value and positioning of the UISP

- » Individuals within the company, who have been championing the partnership at the executive level, can move on leaving the partnership vulnerable to further changes and restructuring
- » Budgetary control over R&D and innovation spending can shift, for example from central R&D control to greater oversight by business units. This can change the nature of the value proposition and expectations for the partnership, as well as affecting the timescales for outputs to be realised
- » Company capabilities can develop in related areas, potentially affecting their choice of what to undertake internally or externally, their ability to work collaboratively with the university partner, and their ability to absorb partnership outputs
- » Financial circumstances can change, with budgets for R&D and innovation being cut, making it harder internally to secure long-term funding for the UISP
- » Company policies may change, for example, regarding IP, contractual terms and conditions, and staff exchanges

Changes arising within universities

- » Principal investigators and researchers central to the partnership may move on
- » Individuals who are not aware of the importance of the strategic partnership and existing relationships, or do not care about them, may act in ways that damage the relationship
- » The university may form strategic partnerships with competitors in areas of key competitive importance to the existing partner
- » University policies may change, for example regarding IP, contractual terms and conditions, and staff exchanges

Changes within the partnership

- » Learning can take place as a result of partners working together – at the individual as well as at the organisational level – and trust can build up between partners. This can lead to an improved understanding of each other's needs and capabilities over time and can reveal potentially unexpected directions for valuable activity to occur. It can also lead to new/refined working practices and partners

becoming more willing to reveal further insights and information

- » Partnership leaders and managers may change and bring new strategic directions to the UISP. New leaders and managers may also not have the institutional memory of what has happened before to shape their approaches, or to resolve difficulties. They may also have different ways of working and managing which can result in tension and disruption within the relationship
- » Individual egos and personalities can clash, creating tension within the partnership and harming the overall relationship
- » People can 'fall out of love' with each other or their interests move in different directions
- » New partners may join the UISP which can lead to additional complexity, disruptions to working practices, cultures and expectations
- » Changes may occur in the scientific and technological landscape
- » New technological platforms may emerge leading to new opportunities and challenges, possibly at other universities
- » Research fields may advance making partnership activity in that area no longer appropriate within that university, or requiring other types of partners to be brought in to take it further along the innovation journey
- » Unexpected new fields of research may emerge which are worth pursuing
- » Changes may occur within the socio-economic and political environment
- » Government policies may change, for example in relation to IP protection, export restrictions and immigration
- » Rapidly-changing competitive environments can lead to quick shifts in the structure of industries and the nature of the competitive threat from perhaps once collaborating firms
- » Major global, industrial, political or macro-economic events may occur with significant impact on entire economic and innovation systems (most recently the great recession of 2008)

5.2 Dealing with change

Understanding how changes and disruptions affect the UISP and how to deal with them is critical to developing resilient, long-term and effective partnerships. Central to this is the development of trust and a mutual belief in the long-term value of the partnership, along with a sense of collective, institutional responsibility to ensure its survival. UISPs were thought to be particularly vulnerable during the early phases of their development, after the excitement surrounding their formation has dissipated, but before strong, trust-based and increasingly interdependent and strong institutional-level relationships have been built up.

Workshop delegates explored these issues and identified a variety of different factors and support mechanisms that can

help UISPs deal with disruption, anticipate change and plan for the future.

Clarity of purpose and objectives

Having a clear purpose and objectives to guide the partnership – even if they evolve over time – helps to provide a clear understanding of why partners are working together and what is being 'fought for'. It helps partners to navigate disruptions and to implement any changes that may be required. It was thought that co-creating a strategic vision and objectives, both initially and at key points in the evolution of the partnership, involving key stakeholders from across the organisation, could also help the partners navigate disruptive periods. It is helpful to ensure that key individuals who can influence outcomes are continuously brought into the relationship and are prepared to fight for its survival.

"There is a sense that once [the partnership is formed], we can leave it to just get on, but there are times where things don't work as planned... science changes direction, organisations' priorities change, and sometimes researchers just fall out of love with each other... If there wasn't a group on either side nurturing and supporting it, then things fall apart... and the reputational damage can be incredibly destructive."

UK university leader

Building institutional linkages and partnership support capabilities

The delegates also highlighted the importance of wider partnership support functions within each partner's organisation, and the value of high-level institutional linkages during periods of disruption.

- » Links at higher levels of the institution can provide an important conduit for resolving challenges and instituting the wider changes required to ensure the sustainability of the relationship
- » Partnership support can be important to help maintain stability during turbulent periods, particularly if the disruptions are from within the wider organisation (e.g. changing organisational structures or innovation strategy). The support functions can help to insulate the partnership from these disruptions, bridge any transition periods, and ensure any changes required are introduced appropriately

Creating opportunities for reflection and adjustment

Disruption may well require a period of reflection, both within the partnership and on the part of each partner, on the appropriate way forward: whether to adapt and sustain the partnership, or wind it down. The ability to create space

for this – potentially taking ‘time-out’ from the partnership without prejudice – was thought to be valuable for navigating such periods.

Delegates also discussed the potential for using certain techniques, such as roadmapping, at critical junctures that necessitate major changes to the partnership. Such techniques can help to develop new strategic visions and priorities that are more aligned to the new circumstances. By using inclusive methods, they can bring important stakeholders together from each organisation, helping to strengthen commitment and buy-in and find ways around key challenges.

Developing agreements for reconciliation, not conflict

There was also a belief amongst some delegates that the way contracts, agreements and operational plans are constructed can affect the ability of the partnership to successfully deal with change and disruption. It was possible, they argued, to develop these documents so that partners were helped towards dialogue and reconciliation in the event of disruption, rather than towards separation, conflict and arbitration. For example, opportunities could be made for people to come together in the event of disruption, to connect and find ways of resolving the issues; or the Scientific Management Board or other governing body could have a role in resolving differences.

Flexibility

Flexibility and willingness to adapt to changing circumstances were often cited as central to the building of a resilient, long-term strategic partnership. Indeed, it was noted by a number of delegates that this was a key sign of a strong strategic partnership. For example, if innovation requires change, do partners insist on sticking to initial plans and objectives, or do they redefine activity to ensure outcomes that are best for both partners (this may, however, require some compromise by both partners, for example, to minimise disruption to students’ projects).

However, increased flexibility often involves being able to accept and accommodate increased uncertainty concerning long-range milestones and planning. There is therefore the need to balance the benefits of long-term stability (e.g. of funding, research focus and individuals involved) with the benefits of increased flexibility and the ability to change direction, scale and focus as needs change. There was a recognition that this was incredibly difficult to achieve, and benefits from strong partnership learning and trust.

A key question raised by the delegates was whether the initial partnership terms and conditions facilitate change and adaptation, or constrain and hinder them. Overly restrictive initial conditions can render the partnership vulnerable to change and unable to adapt. Another potential area that can limit a partnership’s flexibility is the inability to wind down and terminate projects when it is in the best interests of the partnership. This can be made more difficult when prominent scientists are involved and needs to be managed carefully.

Continuous learning

A cornerstone of successful and effective long-term strategic partnerships was thought to be a willingness to continuously reflect and learn – both at the individual and organisational level – from the partnership’s own experiences and from others. Intimately intertwined with this is the willingness to adapt, when necessary, to incorporate learning outcomes. Processes should be built into the partnership to allow space for learning and enable adaptation as appropriate. Learning is particularly important during the vulnerable early phases of the partnership.

Key areas of learning identified at the workshop included:

- » **Sources of value:** the source of value within a UISP may not be very well understood during the early phase of the partnership. As partners develop trust and learn more about each other’s needs, capabilities, constraints and contexts, they learn more about where to focus their efforts to realise increased value from the relationship. Some delegates noted that partnerships can initially begin by addressing challenges defined by the company. However, as understanding builds up between partners and dialogue advances, academics and company researchers find ways of redefining problems at more fundamental levels, and co-identifying additional challenges, that could lead to more valuable and disruptive discoveries and outputs
- » **Working practices at the interface:** how best to work together at the interface may take time to learn and requires adjustments to ensure effectiveness
- » **Absorbing and exploiting outputs:** the most effective pathways for channelling ideas, needs and innovation challenges into the partnership, and how to absorb the resulting knowledge and outputs back into the firm, may not be well understood at the outset. It may require some experimentation and learning on both sides to see what works well and under what circumstances.
- » **Accessing and leveraging wider resources and expertise:** it may take time to develop effective methods for searching and accessing expertise and resources held more widely within each organisation

Learning from what did not work, as well as what did, was seen as important. However, any investigations should focus on understanding why and how to improve, rather than assigning blame. There were also suggestions that partners involved in multiple strategic partnerships – either universities in multiple UISPs with firms, or firms with multiple strategic university partners – could benefit from identifying and sharing effective practices across all their partnerships.

Strong communication built on trust, openness and honesty

Strong communication built on the principles of trust, openness and honesty was seen as absolutely critical for developing partnerships that were effective and resilient to change and disruption. This can help partners explore the

implications of any changes and disruptions and identify possible ways to navigate and solve them, rather than just identifying problems without solutions.

It may be the case that the partnership has to adapt in scale, scope, structure and focus in order to survive. However, it might also be necessary to wind it down. Should changes or disruptions – for example a restructuring – be in the pipeline, clear, early communication built on the above principles was thought to be particularly important. One delegate noted the importance of following a ‘no-surprises’ principle, particularly in advance of formal partnership reviews, to ensure that any difficulties and issues were communicated in a timely and effective manner and could be dealt with appropriately.

Internal communication within the partner’s own organisation was just as important as communication between partners. In multi-touch partnerships, involving different parts of the firm and university (e.g. multiple research-R&D relationships, HR-recruitment relationships, local economic development functions), delegates noted the potential for difficulties to emerge in one part of the overall relationship that could spread to other parts, unless dealt with effectively. This can occur because of poor internal communication and a lack of understanding of how actions in one part of an organisation can affect the wider relationship.

Density of networks for resilience

The multiplicity and density of nodes and linkages between partners were thought to be important for developing resilient UISPs. Partnerships with many people moving across the interface, multiple connections formed between different parts of both organisations, and a large number of individuals at both operational and strategic levels believing in its value, will be more likely to successfully navigate through periods of turbulence and change. Delegates posed the question: how many nodes would you have to break for the partnership to fall apart? This partly reflects the vulnerability of partnerships to the moving on of key individuals.

Examples were given of large (multi-million pound) projects that had been built up around particular individuals, but which had not spread very far. As they developed, the principle connections remained between a very small number of individuals within the university and the firm. When a key individual moved on, it did not take long for the whole relationship to fall apart. Despite it being a large partnership, in reality there were just a few individuals who valued it, leaving it highly vulnerable to change and disruption.

It was therefore suggested that it is very important to involve individuals within the partnership who are willing, capable, and have the necessary resources, to develop and grow the linkages and nodes between partners. It was critical that they act for the collective benefit of the institutional relationship, rather than acting to protect individual-level activity. The value of intermediaries and boundary spanners, with both the resources and the space to develop and facilitate partnership development, was again emphasised.

“It strikes me that, building more connections between organisations and increasing the density of those connections is the key to a robust partnership”

UK university leader

Building an institutional memory

The ability to deal with change and disruption is increased by having a strong institutional memory. This enables those involved at the coalface, trying to navigate the partnership through disruption, to access knowledge about challenges faced in the past and how they were overcome. This helps to avoid repeating previous mistakes and enables the partnership to benefit from lessons learned. It can also help to preserve a mutual understanding of the ‘spirit of the law’, developed through negotiations and discussions that are not easily captured within contracts.

5.3 Planning for the future

Some changes can be anticipated and planned for. Importantly, this can be done while maintaining flexibility in relationships. There was a belief amongst delegates that investing in planning at the beginning of the UISP – for example, establishing processes to deal with the partnership leaders moving on – made it easier to deal with the change when it occurred. Contracts, for example, can include processes for what to do in the event of partnership leaders leaving: how to appoint people, responsibilities etc.

Some delegates also argued that developing a set of partnership ‘guiding principles’ and a strong, clear vision, can be invaluable for providing a touchstone for decision-making further down the road, as the partnership matures. This can become critical when decisions have to be made during times of significant turbulence and disruption.

One delegate also discussed the value of creating ‘playbooks’, providing guidance on what to do in the event of easily-anticipated changes such as the moving on of partnership leaders and managers. Co-developed between partners, they can aid the development of an institutional memory by codifying mutual understanding and operational processes, derived from initial conversations and negotiations, and from partners’ learning experiences.

There were also suggestions about the potential value of developing and using inclusive roadmapping and scenario planning tools to help partners co-create visions and strategies for the partnership, and also to develop a mutual understanding of likely changes that it might face. These could then be used to develop plans for addressing the changes.

It was thought that periodically mapping the relationship between the partners could help identify how nodes and linkages were developing, along with particular strengths and weaknesses, opportunities and challenges. This could help

partners identify how the partnership was changing or should change. There is, however, an obvious balance to be struck between the benefits and burden of gathering and analysing this type of information. There is also a trade-off between top-down partnership control and freedom for organic development at the individual level.

Delegates also argued that UISPs should have a clear exit strategy, detailing what should happen if the partnership needs to be wound down. This should ensure that the termination process is as smooth as possible, minimising disruptions to each partner, at both individual and institutional levels.

5.4 Renewal and termination

University-industry strategic partnerships inevitably face renewal points during their lifetime. UISPs will often have built-in renewal points (e.g. every three to five years) although consideration of whether or not to continue investing in the relationship could arise following such major disruptions and changes outlined earlier in this section, for example if key individuals move on.

Renewing strategic partnerships

Renewal points are important opportunities for UISPs to refresh and renew their vision, overall strategic direction and value proposition to ensure that these remain relevant. However, there was a consensus that renewing a partnership can be much harder than its initial setup. This is not least because, after long periods of time (e.g. three to five years), enthusiasm may have waned, senior leadership attention may have diminished as the partnership activity becomes more embedded and 'routine' for the organisation, and executive sponsors and champions move on.

Periodic partnership reviews, that focus not just on performance metrics but also on reviewing and refining the value proposition and strategic direction, can help to provide important mid-course corrections and ensure ongoing buy-in. However, there may also be real value in providing a facility to enable partners to take a temporary break from the UISP and return after a period of time. This allows them to revisit their own institutional motivations, commitment and strategies for engagement, before returning refreshed to mutually revisit the vision and strategic objectives.

There was support for using roadmapping tools at renewal points, bringing together all the stakeholders to develop joint visions of a new future. There were claims that such techniques could be particularly valuable when working across cultures and languages, allowing greater visualisation and clarity of partnership strategy and direction.

Winding down strategic partnerships

Sometimes partnerships need to end. However, it is important that any wind-down happens in a controlled and amicable fashion. Uncontrolled and acrimonious terminations can lead to reputational damage not just for the individuals involved,

but for the wider institution. Given the long institutional memories of both universities and large companies, this can prevent potentially valuable new partnerships from re-forming for some time into the future. In addition, due to strong social networks and the existence of 'blacklists' on both sides of the university-industry interface, knowledge of damaging terminations can spread beyond those individuals and institutions directly involved. An important function of partnership leaders and support should therefore be to ensure that institutional reputations are protected during times of disruption and, critically, when they come to an end, ensuring that reputations are maintained.

It was seen as generally advisable to have a clear, agreed exit strategy for UISPs and to formally incorporate structured tail-off periods. This helps to minimise any disruptions to wider activities and, importantly, to the careers of individual academics, students and industry staff. Some delegates noted that the additional costs of honouring existing commitments for long enough to minimise disruptions, were greatly outweighed by the additional benefits of maintaining relationships and wider reputations, thus ensuring the potential for future partnerships to emerge should they be necessary and valuable.

6 Roles for government

This section presents the delegates' expert insights and ideas concerning what governments could do to help universities and firms to develop effective and mutually beneficial strategic partnerships. Given that the primary focus of the workshop was on what firms and universities could do to strengthen the relationship, this section should not be considered to be a comprehensive assessment of all the potential roles for government agencies in this area, but rather where delegates identified particularly important or pressing areas for review or development.

The policies and funding programmes created by government aimed at strengthening the linkages between the university-base and industry, with the objective of driving innovation in the economy, need to be responsive to evolving trends in partnership models and knowledge-translation processes. A number of major national reviews in both the UK and US in recent years have sought to identify how university-business linkages are changing and the implications for public sector support. These include:

UK	Witty Review (2013) <i>Encouraging a British Invention Revolution: Sir Andrew Witty's Review of Universities and Growth</i> Wilson Review (2012) <i>A Review of Business-University Collaboration</i> UK Innovation Research Centre, National Centre for Universities and Business (2012) <i>Growing Value: Business-University Collaboration for the 21st Century</i>
US	National Research Council (2014) <i>Furthering America's Research Enterprise</i> National Research Council (2012) <i>Research Universities and the Future of America: Ten Breakthrough Actions Vital to Our Nation's Prosperity and Security</i> President's Council of Advisors on Science and Technology (2008) <i>University-Private Sector Research Partnerships in the Innovation Ecosystem</i>

However, while these have frequently identified the trends within large firms towards forming longer-term, deeper and strategic partnerships with fewer universities, few have explored the implications of this specific trend for what governments can do to support the knowledge development, acquisition and exploitation processes.

Setting the scene: key differences in the US and UK government funding landscapes

In reading this section, it is important to recognise that the funding landscapes in the US and UK are both diverse and complex, and organised quite differently. There are important variations in both the types of agencies involved and the geographical level at which funding programmes are developed and delivered. Some key differences and issues to be considered are:

- » The role of mission agencies (e.g. Department of Defence, Department of Energy) in funding research and translation activities and programmes in the US
- » Funding tends to be more challenge-driven in the US, with single agencies covering more of the innovation value chain than in the UK, where funding for different parts of the technology development process are often dispersed between different agencies
- » National research laboratories in the US play a more prominent role in the research and translation landscape, alongside universities, compared with the UK
- » The existence of stable, formula funding in the UK for both research and knowledge translation complementing often competitive research council, industrial and philanthropic grants and contracts
- » The important role of individual states in the US in developing programmes to support and strengthen research and knowledge translation activity (e.g. Ohio Third Frontier programme, California's investments in quantitative biosciences, QB3), and the complex political and economic relationship between the federal and state governments. While the relationship between the regions and the national government in the UK is much weaker, UK research and knowledge translation funding programmes are complicated by the role of European funding in this area

Two important funders of basic research are the National Science Foundation (NSF) in the US and the Engineering and Physical Sciences Research Council (EPSRC) in the UK. They are both increasingly involved in developing and implementing programmes aimed at strengthening university-industry linkages and facilitating the translation and transfer of research into industrial applications. The workshop benefited from presentations by senior representatives from both of these organisations, helping to

frame the wider discussions of the delegates on the role of government in supporting and enabling strategic partnerships to emerge and develop.

Despite these inherent differences, the workshop discussions identified key lessons and insights that were likely to apply in both the UK and the US. These are outlined below.

6.1 Supporting the scale and depth of the university-industry interface

One important way governments can support the building of strategic, university-industry partnerships is by supporting growth in both the scale and depth of the university-industry interface. This allows firms to plant many seeds across the academic base, forming initial linkages, some of which may then grow into larger, longer-term strategic partnerships. Delegates argued that funding programmes and policies that increased the bandwidth of universities to form and host relationships with industry would be valuable. However, the precise nature and advantages/disadvantages of alternative

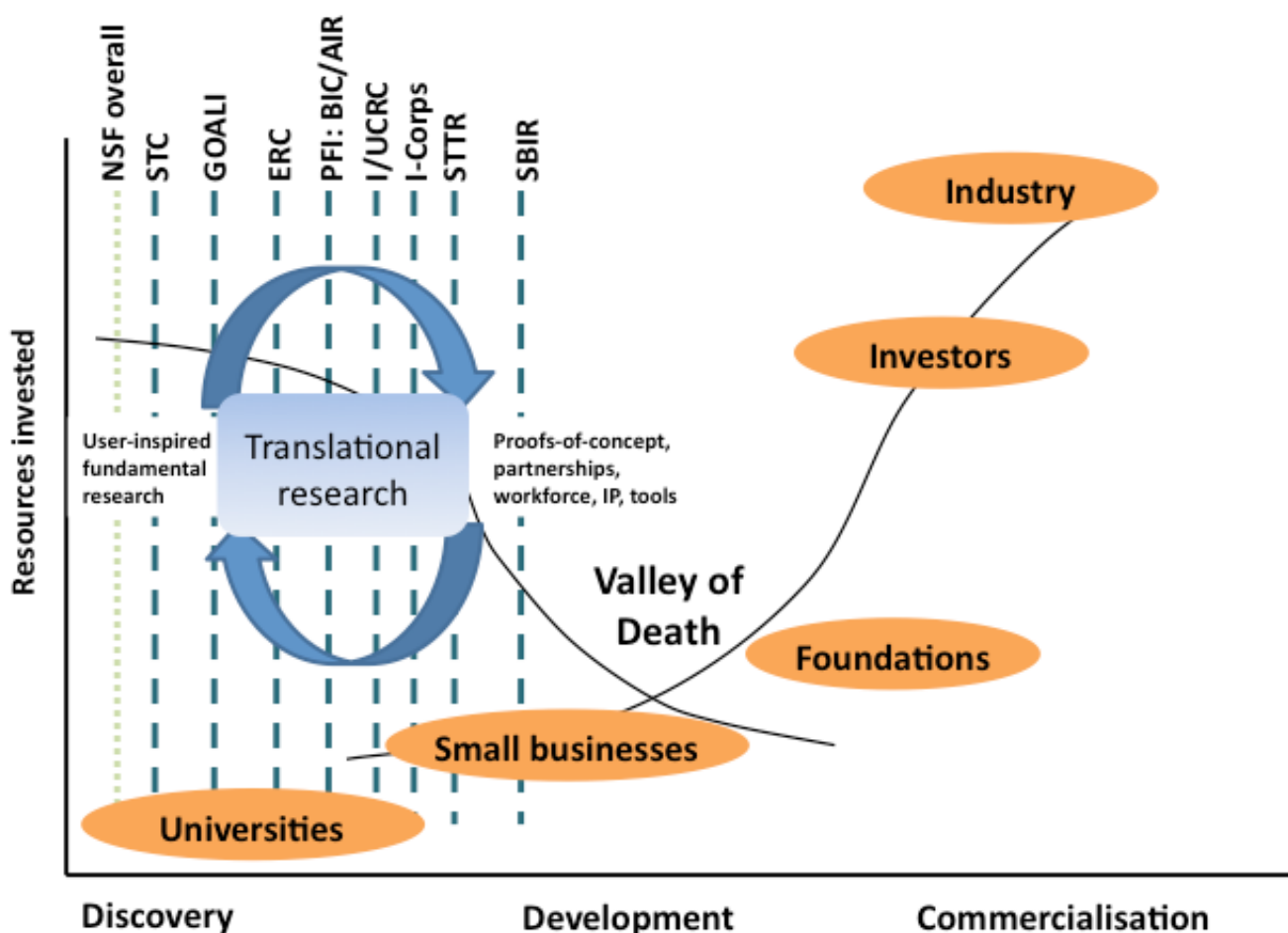
funding programmes were not covered fully and would warrant more detailed attention in further work.

The workshop benefited from the insights provided by two of the major national funders of research: the National Science Foundation (NSF) in the US and the Engineering and Physical Sciences Research Council (EPSRC) in the UK. The NSF highlighted the development of a suite of programmes that seek to support the translation and commercialisation of publicly-funded research. Importantly, these have been positioned explicitly to address different types of challenges faced in the early stages of the technology development journey (Figure 5).

Key finding

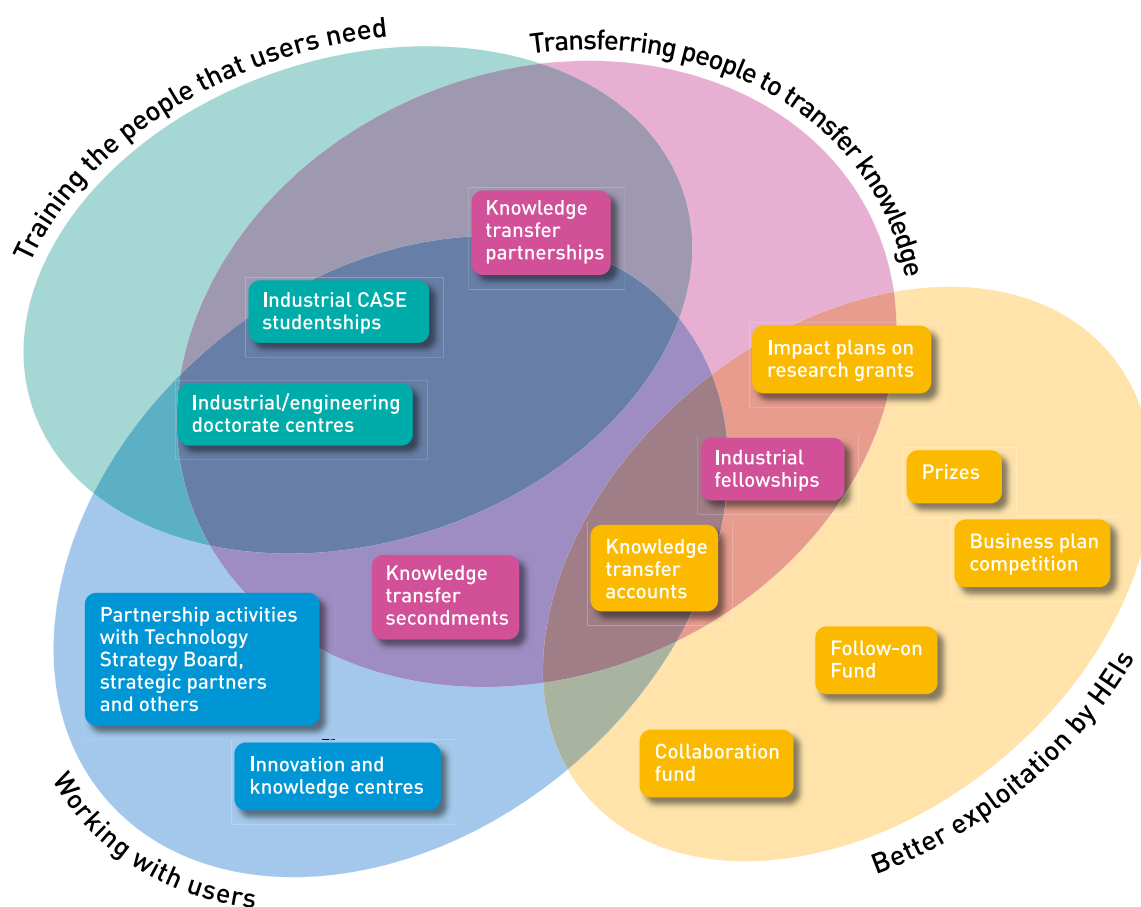
Policies and programmes to support growth in the scale and depth of university-industry collaborations enable strategic partnerships to emerge and flourish

Figure 5: NSF programmes supporting the commercialisation of research in the US



Abbreviations: STC: Science and Technology Centres; GOALI: Grant Opportunities for Academic Liaison with Industry; ERC: Engineering Research Centres; PFI-BIC: Partnerships for Innovation: Building Innovation Capacity; PFI-AIR: Partnerships for Innovation: Accelerating Innovation Research – Research Alliance / Technology Transition; I/UCRC: Industry/University Cooperative Research Centre; I-Corps: Innovation Corps; STTR: Small Business Technology Transfer Programme; SBIR: Small Business Innovation Research Programme

Source: Adapted from Montelli, R. presentation on “Industry University Cooperative Research Center Program (I/UCRC): more than 40 years fostering industry-university partnerships

Figure 6: EPSRC funding programmes supporting research exploitation

Collaborative research activity

Collaborative training activity

Secondment opportunity

Exploitation support

Source: EPSRC Better Exploitation

The EPSRC, the primary national funder for engineering and physical sciences research in the UK, is also active in helping to build capability and capacity within the academic base to help transfer knowledge and technologies into industry. It has developed a range of programmes to support this process and has clustered them into the following key groups, focusing on addressing different core challenges:

- » Training the people that users need
- » Transferring people to transfer knowledge
- » Working with users
- » Better exploitation by HEIs

In addition, the public sector is also a major funder of capital infrastructure within the research base. Capital infrastructure was seen as a critical enabler for universities, not just to underpin excellence in their core activities, including research, education and innovation-related translational activity, but also to provide appropriate spaces for connections

to form and for major industrial partnerships to operate. However, delegates noted the difficulties in securing investments for capital infrastructure, given that impacts from these investments are hard to capture and can take many decades to realise.

There were also suggestions from the US delegates that new, additional funding for university-industry programmes is rarely made available at the federal level. New programmes typically involve reallocating existing resources. However, decisions at state level can lead to the emergence of additional funding to support university-industry linkages.

Key finding

Capital infrastructure investment is important for enabling large scale, longer-term strategic partnerships but can be hard to secure

6.2 Resources for building capabilities and competences

Delegates emphasised repeatedly that university-industry strategic partnerships – while having the potential to deliver significant added value both to university and industry partners – are resource intensive. They require support as they emerge and develop, particularly during the initial phases, during times of change and disruption, and at renewal points. In addition, individuals involved at the interface also need to develop their capabilities for working effectively across boundaries, both between the partners and within their own organisations. All of this means that adequate resources need to be in place to nurture and sustain strategic university-industry partnerships.

Some of these resources may be partnership-specific and can be incorporated into the overall costs of that investment. Delegates argued that leading and managing partnerships is time-consuming and needs to be appropriately resourced and accounted for in workload planning and partnership budgets. In addition, careful consideration should be given to who manages these large-scale partnerships: should dedicated project managers be appointed or should academics be expected to perform this role in addition to their core activities? Delegates also noted that, while there have been some very positive and successful experiences of academics managing such partnerships, there have also been some very negative ones. Where academics do manage and coordinate strategic partnerships, they need to have the capabilities, resources and time to do so.

However, there is also the need for institution-level resources to be put in place that are not specific to any individual partnership, but necessary to develop the appropriate capabilities, competences and processes to facilitate the development and nurturing of these types of partnerships. For example, are there individuals in place with the necessary resources to respond to emerging opportunities and to work with a potential partner to develop a strong, mutually beneficial value proposition? Stable, yet flexible institution-level funding was seen as critical for enabling universities to build the necessary long-term capabilities and competences to develop and nurture these types of partnerships. It was also essential to enable organisations to respond rapidly to emerging opportunities and deal with sudden disruptions.

Key finding

Institution-level resources are critical for enabling universities to build up dedicated and flexible capabilities and competences for growing and nurturing strategic partnerships.

6.3 Brokerage

The workshop also highlighted the potential role government agencies can play in making information available on university capabilities and competences. This information makes it easier for potential users in industry or elsewhere to identify those institutions, and potentially specific individuals within them, most relevant to their needs. Efforts are underway in this area, both in the US (for example through the multi-agency STAR Metrics Federal RePORTER programme¹) and in the UK (for example, through the Gateway to Research website², and the EPSRC's portfolio visualisation tool³ and equipment.data web portal⁴).

In addition to automated tools for exploiting the information provided in grants and other internal databases of government funding agencies, those working within these agencies often have a significant amount of tacit knowledge of centres of excellence within the academic base and their different portfolios of activity. Certainly in the UK, firms are starting to engage with research councils in more systematic ways to access this knowledge to help them to identify key institutions and individuals to approach.

Key finding

Efforts in both the UK and US to enable greater access by firms to information held by governments, about the capabilities and competences within the university base, are valuable and should be strengthened.

6.4 Challenge-led and leveraged funding opportunities

Government agencies can also play a role in identifying innovation challenges of key national or social importance (e.g. defence, health, sustainability). They can provide spaces to convene relevant stakeholders to identify, shape and define key challenge areas in which public investment in the public research and translation space is critical e.g. where investment is too risky for individual firms or there is a high level of social benefit but less private benefit. They can also help stimulate connections within an emerging innovation system, between disconnected stakeholders with complementary interests and capabilities.

There were urgent calls for improving the dialogue between government agencies, universities and industrial partners when these tripartite initiatives are set up to tackle major innovation challenges, particularly when government is expecting high levels of industrial contribution. Examples were cited by delegates, from both the US and UK, where

1 <http://federalreporter.nih.gov/>

2 <http://gtr.rcuk.ac.uk/>

3 <http://www.epsrc.ac.uk/research/ourportfolio/vop/>

4 <http://equipment.data.ac.uk/>

Key finding

Dialogue needs to improve between universities, industry and government when creating major tripartite initiatives.

governments have implemented initiatives despite significant opposition from the organisations they were then targeting for investment.

Long-term commitment by the public sector to address major challenge areas can help reduce the risk for universities and firms investing in these areas. It allows each institution to leverage its own resources, and make them go further, in the knowledge that relevant stakeholders are committed for the long term. In addition, large-scale funding in these areas (e.g. for any necessary capital investment or major research institutes) can provide a platform for university-industry partnerships to form and develop.

Delegates also noted the importance of challenge-led funding, not just in advancing early-stage research and technology development, but also to support programmes addressing gaps in complementary areas (e.g. future skills, standards, industrialisation/scale-up). In addition, resources were also needed to identify and coordinate the range of investments that need to be made in different areas to ensure that they can adequately and appropriately address increasingly complex, system-level innovation challenges.

Key finding

Coordination is critical for initiatives involving large, complex systems and needs to be funded.

6.5 System-wide incentives and expectations

The policies, funding programmes and actions of governments can have a powerful effect on academic behaviour, not least by ensuring that university-industry interactions are appropriately rewarded and legitimised at both an individual and institutional level. The behaviour of academics – particularly those who are active in research – is driven to a large extent by incentives set outside the university, including achieving a global reputation amongst peers for research, and meeting the terms, conditions and expectations attached to research funding. The incentives established by senior university leaders, while very important, are therefore only part of a wider system of incentives affecting academic behaviour set by different players in the system, including national research funders and government agencies.

For example, winning a highly competitive research grant from one of the primary UK or US national research funders (particularly the National Science Foundation or National

Institutes of Health in the US and the Research Councils in the UK) brings a significant degree of prestige for the individual or centre concerned. There is therefore significant potential for research funders to provide important signals to academics about the types of activities, interactions and behaviours expected of them by the terms and conditions they set for these grants. Research funders play an important role in creating an environment that not only rewards academic excellence but also embraces and rewards university-industry interaction, at both an individual and an institutional level.

Key finding

Research and university funders play an important role in creating a fertile environment for university-industry collaboration through the expectations and conditions set for their funding programmes and grants.

Where industrial collaborations are expected as part of a grant's terms and conditions, unnecessary barriers or burdens should not be created in relation to university-industry interactions. Careful attention is needed to ensure that any IP conditions and expectations are appropriate for the type of research that is being undertaken and also for the balance of contributions being made by the different partners.

In addition to supporting research activity at an individual level, the UK government, and (typically) state-level governments in the US, provide funding to institutions for university activities. This funding not only supports the development of capabilities and competences for research and education (which are often the primary reasons why many firms seek to engage with universities), but also economic development activities such as business incubation, technical assistance, and the provision of public spaces for interactions to form and develop. These institution-level funding schemes also help to provide the resources to enable universities to build up the necessary capabilities and competences to develop major strategic partnerships with industry. Again, the conditions and expectations attached to these institution-level grants can be an important influence on university leaders, their strategies, and the way they allocate internal resources to achieve specific goals. This can help to ensure that the university environment is conducive to developing and nurturing long-term university-industry partnerships at all levels.

For example, the UK government systemically allocates funding to support university-industry interactions through the Higher Education Innovation Funding (HEIF) programme, based on university performance in undertaking knowledge exchange. In the US, many states also fund programmes run by public universities to support key areas of education, economic development, and local technology translation and innovation. Some, such as Georgia, Ohio and California, have been active in developing universities

Key finding

Investments in the university base – in research, education, knowledge exchange and capital – need to be assessed from a systems-perspective and treated as a portfolio.

capabilities to act as innovation hubs, in close collaboration with industry.

Workshop delegates argued strongly that governments needed to treat their investments in the university base – across research, education, knowledge exchange and capital investment – as a portfolio covering different types of activities. For example, investments in one area may be critically important for enabling functions in other areas. They should therefore be considered from a holistic, systems-wide perspective in order to achieve particular outcomes. There were suggestions that governments need to be careful not to reduce investment in the fundamental research that provides the feedstock of knowledge for more applied and translational activity. Without this investment, further investments in knowledge exchange may be less effective. Indeed, a key motivation for large, research-intensive firms looking to form long-term strategic partnerships with universities is to tap into this underpinning, fundamental knowledge, and support its translation into disruptive technologies and innovation. In addition, the exploitation of this research may also require advances in complementary technologies and competences (e.g. industrialisation/scale-up challenges) and require other types of additional research to be undertaken.

Delegates also thought that governments should establish the criteria for public investment in research and innovation, in particular for emerging technologies. This would make it clear where the public sector is willing to invest and, critically, how and when it expects investments to transfer from the public to the private sector, as technologies advance and develop. For example, where research investments carry very high technological risk and uncertainty, there is a strong case for public sector investment. As the degree of risk and uncertainty reduces, government agencies can require increased private sector leverage/matched funding as a condition of continued public investment.

Key finding

Governments should establish clear criteria for public investment in research and innovation and in particular for emerging technologies.

6.6 Complexity of funding and coordination of programmes

The inadequate integration and coordination of funding programmes for research and innovation – they are often managed by different government agencies – can create unnecessary challenges and obstacles for technology development, hindering activities within major, strategic university-industry partnerships. Gaps can be created, as well as unnecessary duplication of support, as technologies develop, with potential difficulties in transitioning between different phases (e.g. between developing a prototype and scaling-up/industrialisation). Delegates were concerned that not enough was being done to ensure that the different funding programmes ‘fit’ together, enabling smooth transitions as technologies advance. There was also concern over the complexity of the funding system with many different support programmes available from different agencies, and overly complicated and burdensome processes to access them.

Key finding

Governments need to ensure that their portfolio of programmes do not create unnecessary barriers as technologies develop, and enable smooth transitions between programmes and agencies.

Coordination and integration problems can exist along a number of dimensions creating gaps in, as well as duplication of, support:

- » **Different stages of the technology development journey** in which particular stages are too aggregated and boundaries are too rigid or poorly specified
- » **Different regional and national programmes** funding various types of activity in the same area but with little coordination and potential duplication. In the US, coordination issues exist between the states and the federal government, while in the UK this occurs between the regions, national government and the European Union
- » **Different types of firms**, with unhelpful distinctions often made between small and medium-sized companies and large firms, and with less focus on systems and value chains. This may potentially obscure wider, sectoral or technological challenges and hinder certain types of challenges being addressed and partnerships from being formed.

Delegates suggested that while the US was thought to be more bureaucratic and burdensome than the UK, the federal funding programmes available were more integrated with the technology development process. For example, the NSF explicitly and actively positions its funding programmes at different stages of technology development to minimise the potential for gaps (see Figure 5).

6.7 Doctoral and postdoctoral programmes

Capable and talented doctoral students and postdoctoral researchers are often critically important for the success of strategic university-industry partnerships, not least because they often undertake much of the work under the guidance of more senior academics. In addition, evidence suggests that the majority of doctoral students will not become career academics, either from preference or lack of job opportunities. As such, many doctoral students will end up with careers in the private, public or charitable sectors, some of which may require advanced research capabilities and competences. As the open innovation model takes hold within many large firms in different sectors, capabilities and competences for working effectively across organisational boundaries and collaborating with external partners such as universities – assimilating and exploiting the resulting knowledge to create commercial products and services – become critical to a firm's competitive advantage.

There were strong suggestions by the workshop delegates – in particular those from industry – that much more could be done to create doctoral and postdoctoral programmes that develop people better suited to today's economies, in which open innovation and collaboration are increasingly dominant. This idea provoked some questions. Should doctoral and postdoctoral programmes be specifically created to target individuals who want industrial careers, rather than remaining in academia? What opportunities can be created within these programmes to ensure that individuals have the necessary skills and capabilities to lead open innovation activities within firms and other non-academic organisations? What types of training, skills development and on-the-job experiences should be provided for such doctoral students and postdoctoral researchers to ensure they are able to work effectively across organisational boundaries?

However, the need for new doctoral and postdoctoral programmes should be seen as additional to the more traditional, academic-focused programmes that create the next generation of leading academics. The workshop delegates suggested allowing a greater diversity of programmes to co-exist, producing different types of advanced human capital and providing more options for students looking to undertake advanced research training.

Key finding

There is significant potential to create a greater diversity of doctoral and postdoctoral programmes that develop people who can lead industrial innovation programmes with strong links to academia.

7 Conclusions

Strategic partnerships are on the rise and are becoming more important for both universities and companies. These long-term, deep relationships are formed at a senior level of universities and companies, transcending projects and individuals, and offer an expected return that is greater than the sum of outcomes from individual projects. In particular, many large, research-intensive companies in sectors such as life sciences, aerospace, energy and consumer goods, have been rationalising their investment in universities to focus on a core set of strategic, longer-term partnerships, curtailing the number of non-core universities with which they engage. At the same time, universities are themselves increasingly active in looking to build relationships with companies, and other organisations within their target user communities, with whom they can form stronger, deeper and longer-term relationships. Worryingly for the UK and US however, company decisions are increasingly being taken in a global context, and universities in both countries are facing increasing competition for these types of larger, long-term investments, not least from key emerging economies, which combine a greatly strengthened scientific base with large markets for these firms' products and services.

The workshop convened over 70 senior, expert practitioners from US and UK universities, multinational firms and US and UK government agencies, to discuss what needs to be done to strengthen the ability of universities and industry to develop mutually beneficial and effective strategic partnerships. It found that, if successful, these partnerships can unlock significant additional value for both the firms and universities involved. Importantly, the types of contributions are often multi-dimensional, stretching well beyond the generation of new knowledge from individual research projects or support for student recruitment. They enable firms to take a more coordinated and holistic approach to leveraging the resources, knowledge and wider expertise within academia, in order to develop and strengthen the capabilities and competences needed for their innovation activities (e.g. tacit and codified knowledge, know-how, practices and processes, tools and techniques). These can feed into different stages of the value chain, from early stage technology development to scale-up, production, logistics, marketing and sales.

However, these types of partnerships can be hard to secure and resource-intensive to set up and manage. They can require new capabilities and competences to be developed to enable partners to work effectively at the interface, as well

as to support the partnership. Given this, universities may only be able to host a limited number of such partnerships effectively. Knowing when not to form a strategic partnership is therefore just as important as knowing when one should be formed.

Successful university-industry strategic partnerships appear to be built on the following core principles:

- » Mutual benefits (i.e. win-win for all partners involved)
- » Alignment of interests, expectations and objectives, recognising the intrinsic differences between industrial partners and universities
- » Strong commitment and desire to engage, from the critical decision makers to the researchers on the ground
- » Willingness to learn, adapt and experiment with new ways of working together, and with pathways to transfer and exploit knowledge and technologies
- » Building deep, trusting relationships at different levels of the organisations
- » Openness, transparency and effective communication

Many successful, strategic partnerships emerge from existing relationships between individuals. However, some cases were identified that originated at a more strategic level, driven by leadership decisions to target particular universities. While the former are likely to benefit from existing, trust-based relationships and some understanding of each other's working practices and cultures, the latter face the additional challenge of building up such relationships and understanding. In addition, central to the success of these partnerships is the ability to develop mutually-beneficial value propositions and secure commitment and buy-in, not just from the senior leadership and critical decision makers within each partner organisation, but also from the academics and industrial staff expected to work at the coalface. Clarity, alignment of interests and objectives and managing expectations are also all important characteristics of successful partnerships. A number of firms particularly emphasised the importance of managing expectations for new partnerships: over-promising and under-delivering was the easiest way to destroy nascent partnerships.

Also critical was developing a much better understanding of each partner's needs and objectives, motivations, capabilities and competences, constraints and limitations on what is possible. This is underpinned by the strength and depth of

dialogue that emerges between partners, often only once trust and familiarity have been established and both individuals and the wider organisations are fully committed. Such strong relationships provide an environment in which the firm is able to more confidently share increasingly strategic and proprietary technical information and core technology challenges. However, it can take time to reach this position. In addition, it was recognised that industry may not always know what it wants at the outset or how it might best benefit from the advances in knowledge taking place at the frontiers of technology within the research base. Sometimes this is only revealed as a result of the deep, ongoing dialogue between academics and their industrial partners.

Flexibility and the ability to adapt over time are also critical for building long-term strategic partnerships. Foreseen and unforeseen events within the company or university, the wider industrial system and the socio-economic and political system can significantly disrupt the relationship. In addition, new and valuable collaboration opportunities, requiring a change in partnership focus, may only be revealed once the relationship has achieved a certain breadth and depth, as well as a high level of trust.

Learning, both within the partnership and from other experiences, is central to developing effective and sustainable strategic partnerships. This is particularly important in the early phases when partners are unlikely to know the full extent of the value proposition, or what mechanisms will be most effective for working together. Partnerships may also need to reflect on the most effective way to transfer outputs back into the firm as well as how the needs of internal users will be understood. These issues may not be fully understood at the outset and may change over time. Importantly, any learning processes need to be coupled with a willingness on the part of both universities and firms to adapt and experiment with new mechanisms, structures and pathways.

'Boundary-spanning', individuals who are not just able to interact effectively across the university-industry interface but also with their own, often complex, organisational structures, were seen as particularly important. They not only provide important support for the partnership, helping it to develop, but also help in identifying new opportunities and facilitating new nodes and linkages to form between the partners. They were also seen as important for helping to guide the partnership during times of significant disruption and change. However, these individuals need to be given dedicated time and resources to perform this role.

Governments and their research and university funding agencies can have important enabling and facilitation roles to play in the development of effective, strategic university-industry partnerships. They are major funders of the university base with a duty to ensure that value is realised from these investments. They have a powerful ability to help create a fertile environment in which productive and sustainable university-industry linkages – of all types – can form and grow. Some of these linkages are likely to become strategic.

Key suggestions for areas in which governments could improve their support include:

- » Strong policies and programmes, designed to extend the scale and depth of university-industry collaborations, are needed. These are valuable for helping to sow the seeds from which UISPs emerge
- » Government research and university funding agencies need to ensure the expectations and conditions set by their funding programmes help to create a fertile environment for university-industry collaboration
- » Flexible, institution-level resources are needed within universities, as these are seen as critical for enabling them to build up the necessary dedicated capabilities, competences and support structures
- » Capital infrastructure investment is important for enabling large-scale, longer-term UISPs to thrive, but can be hard to secure
- » Investments in the university base – to support fundamental and more applied/translational research, education, knowledge exchange and capital projects – need to be assessed from a systems-wide perspective and treated as a portfolio
- » Challenge-led funding programmes can provide a focal point around which universities and industry can coalesce, but dialogue needs to be improved between government agencies, universities and companies when putting these in place. Coordination functions are also critical for delivering large-scale, complex, challenge-led programmes and need to be adequately resourced
- » Governments can help to convene groups of universities, firms and other organisations around a particular challenge theme, strengthening communal understanding of needs, capabilities and constraints, seeding a nascent community of practice, and thereby catalysing relationships in these areas
- » Greater clarity is required concerning when the public sector can be relied upon to invest in the different stages of the technology development and innovation journey
- » Governments should ensure that their portfolio of programmes do not create unnecessary barriers as technologies develop, and support smooth transitions between programmes and agencies through all the phases of technology development
- » New types of doctoral and postdoctoral programmes could be developed that create strong pathways into industrial careers requiring advanced capabilities, while also helping to build individuals with the skills to work effectively across organisational boundaries in a world of 'open innovation'

While more can and should be done by governments, universities and firms to nurture effective and sustainable strategic partnerships, it is recognised that we have come a long way in the past decade. However, we should not become complacent. The learning taking place across the UK and US

systems – coupled with the willingness of universities and firms to experiment and try new ways of working together and new pathways to commercialisation – has helped our nations to develop a strong competitive position in relation to these types of investments. We need to continue this process of experimentation and learning – in and between universities, firms and government agencies – to continue to strengthen the conduits for challenges, ideas, knowledge, talent and understanding to flow between these organisations, and to facilitate the emergence and growth of effective and mutually-beneficial, long-term strategic partnerships that will drive the major disruptive technological advances and innovations of the future.

Key challenges moving forward

While the workshop covered a significant amount of ground relating to developing and nurturing effective, strategic university-industry partnerships, a number of questions emerged warranting further exploration. These include:

- » How does the value proposition evolve as partnerships mature and for different types of firms? How can the challenges associated with securing buy-in be overcome, particularly following disruptive events?
- » What novel mechanisms are being developed to strengthen the absorptive capacity of partners?
- » What more can be done to encourage the movement of individuals across the university-industry interface?
- » How can firms best organise their portfolio of global strategic partnership to maximise their overall value for the organisation? What are the key challenges for achieving this? What capabilities and resources do universities require internally to facilitate global partnerships with other universities in a firm's portfolio? What government-level impediments need to be removed?
- » How can strategic partnerships between universities and large firms be leveraged to support innovation challenges in the firm's wider supply chain?

Appendix: Participating organisations

Aston University
BP
California Institute of Technology
Central Technology Transfer Office, Ireland
Centre for Science, Technology and Innovation Policy, University of Cambridge
City University, London
Coventry University
De Montfort University
Department of Business, Innovation and Skills (UK)
Edinburgh Napier University
Engineering and Physical Sciences Research Council (EPSRC)
Essex University
Georgia Institute of Technology
GlaxoSmithKline
Harvard University
Higher Education Funding Council for England
IBM
Institute of Cancer Research
Isis Innovation Ltd
Leeds Metropolitan University
National Science Foundation (US)
Newcastle University
Northrop Grumman Corporation
Novo Nordisk
Pfizer
PraxisUnico
Procter & Gamble
Science and Innovation Network (SIN)
Sheffield Hallam University
Shell Global Solutions
Staffordshire University
The Boeing Company
UK Innovation Forum
University College London
University Industry Demonstration Partnership
University of Birmingham
University of California, Berkeley
University of Cambridge
University of Chichester
University of Durham
University of Glasgow
University of Hull
University of Liverpool
University of Nebraska-Lincoln
University of Oxford
University of Sussex
Warwick Ventures Ltd

About CSTI and its research into university-industry partnerships

The University of Cambridge Centre for Science, Technology and Innovation Policy (CSTI), led by Dr Eoin O'Sullivan (eo252@cam.ac.uk), carries out applied research exploring what makes national innovation systems effective at translating new science and engineering ideas into novel technologies and emerging industries. Key research themes include: economic value capture from industrial innovation systems; innovation system regulations and standards; technological emergence; manufacturing systems; and the public research base and the innovation journey.

Research into the functions and value of the public research base in the innovation system

Tomas Coates Ulrichsen (tc267@cam.ac.uk) leads a programme of research to advance our understanding of the contributions of the public research base – and universities in particular – to processes of technological emergence, industrial innovation and economic development. A key focus is on improving our ability to differentiate the roles, functions and contributions of different types of organisations – in particular the many universities and increasing number of intermediate research institutions – that co-exist in a national innovation system. The research pays particular attention to the partnerships that form between the research base and the wider industrial and innovation system and the contributions these make to the processes of technology development and innovation.

For further information on research at CSTI see:

www.ifm.eng.cam.ac.uk/research/csti

If you would like to engage with research in the area of university-industry partnerships contact:

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