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Assessing the impacts of student-focused knowledge exchange funding

A technical report for the Office for Students

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*Updated in December 2020 to account for significant developments in the Graduate Outcomes Survey

Contents

1 Introduction

This technical report presents and discusses key issues and methods for assessing the impact of the Department for Education (DfE) contribution to the Higher Education Innovation Fund (HEIF). The motivation for this report is the need for the Office for Students (OfS) to be able to demonstrate that the £47 million DfE contribution to the £210 million Higher Education Innovation Fund (HEIF) is delivering value for money with respect to its particular education- and student-focused objectives.

HEIF currently distributes £210 million to English Higher Education Institutions (HEIs) "to support and develop a broad range of knowledge-based interactions between universities and the wider world, which result in benefits to the economy and society"[1]. The fund draws £163 million from the Science Budget and the National Productivity Investment Fund, and £47 million from the Department for Education. The mix of science and education budget contributions in funding HEIF reflects the underlying mix of research and teaching related competences of HEIs which drive knowledge exchange linkages that form to address particular needs in the economy and society.

Evaluations and studies on the nature and impacts of HEIF have highlighted its importance and value in generating knowledge exchange (KE) outcomes (Hughes et al., 2016, 2011; PACEC, 2015a, 2015b; PACEC/CBR, 2009; Ulrichsen, 2015a, 2014). These studies have also established the variety of outcomes achieved through a wide range of KE activities from different types of English HEIs. These benefits are felt by a wide range of organisations across the private, public and charitable sectors. Benefits are also realised by those individuals involved in the process although much of the evidence here is on the academic and how KE influences their research and teaching activities (Hughes et al., 2016).

When HEIF was managed through the Higher Education Funding Council for England (HEFCE) there little pressure to distinguish the contributions made by the different sources of funding in delivering certain types of outcomes. However, with the separation of HEFCE into Research England (now part of UK Research and Innovation) and the OfS, there is now a need to ensure that the DfE investments in HEIF are generating outcomes aligned to their student-focused strategic priorities. This presents particular challenges in the short-term, not least as there has been less focus historically on *who* within a HEIs undertakes KE and how they personally benefit from it. Rather the focus has historically been on capturing the external benefits to the economy and society and the variety of KE mechanisms involved in delivering them. The contribution of students to these processes, and how they benefit from it, have been less well explored. Given this, there is thus a first significant challenge is in clearly defining how one might think about student-focused KE and thus the scope of activities and objectives that are appropriate for the DfE investment to HEIF. Defining the scope of the public 'intervention' is a key part of any policy development and evaluation process (HM Treasury, 2003).

The report is organised as follows. Section 2 first considers the policy development cycle in the UK and how monitoring and evaluation fits into it. It also presents key frameworks, rationales for government investment, and issues facing evaluations of KE-type funding programmes. Section 3 then turns to defining what is meant by KE and explores the variety of mechanisms and internal and external agents involved in the process. It explores how one might define KE-S activities and the

[1] https://re.ukri.org/knowledge-exchange/the-higher-education-innovation-fund-heif/

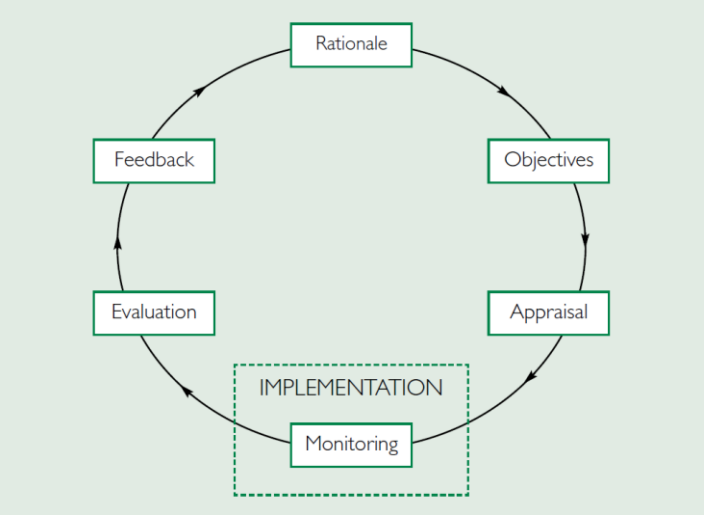
availability of robust data on them. Section 4 examines what we have learnt from previous evaluations of KE funding programmes on methods for capturing the impacts of such funding. Section 5 brings the material presented together to move towards developing an evaluation framework for KE-S, including discussion of key issues that will be faced. Section 6 discusses how we might move towards a practical next steps for assessing the impacts of KE-S funding.

2 Monitoring and evaluating policies in the UK

Before dealing with the specific issues of how one might go about assessing the impacts of KE-S funding, it is important to understand where and how monitoring and evaluation fits into the policy development cycle, and the key relevant features and frameworks that shape any approach. In the UK context good practice guidance on these topics is provided by the HM Treasury's Green Book (HM Treasury, 2003) and Magenta Book (HM Treasury, 2011).

This guidance formalises the policy development and implementation cycle and distinguishes key phases captured by the acronym ROAMEF: Rationale, Objectives, Appraisal, Monitoring, Evaluation, and Feedback (HM Treasury, 2003). This is shown in Figure 1. The guidance notes that these phases, while shown as sequential steps in circular journey, are often iterative and strongly interdependent.

Figure 1 The ROAMEF policy cycle



Source: HM Treasury(2003)

Monitoring and evaluation are critical to effective policy implementation and informing future development and refinement (or indeed termination) of the policy to ensure success and value for money. In particular:

- Monitoring seeks to check progress against planned targets and can be defined as the formal reporting and evidencing that spend and outputs are successfully delivered and milestones met
- Evaluation is the assessment of the policy effectiveness and efficiency during and after implementation. It seeks to measure outcomes and impacts in order to assess whether the anticipated benefits have been realised

A well-designed policy will develop a strongly coupled monitoring system and evaluation plans to ensure that robust data is collected throughout the lifetime of the policy to support not just the routine management of the policy, but also to feed into the planned evaluations. As such, the monitoring and evaluation elements of the policy development should be designed together, guided by the specific objectives of the policy.

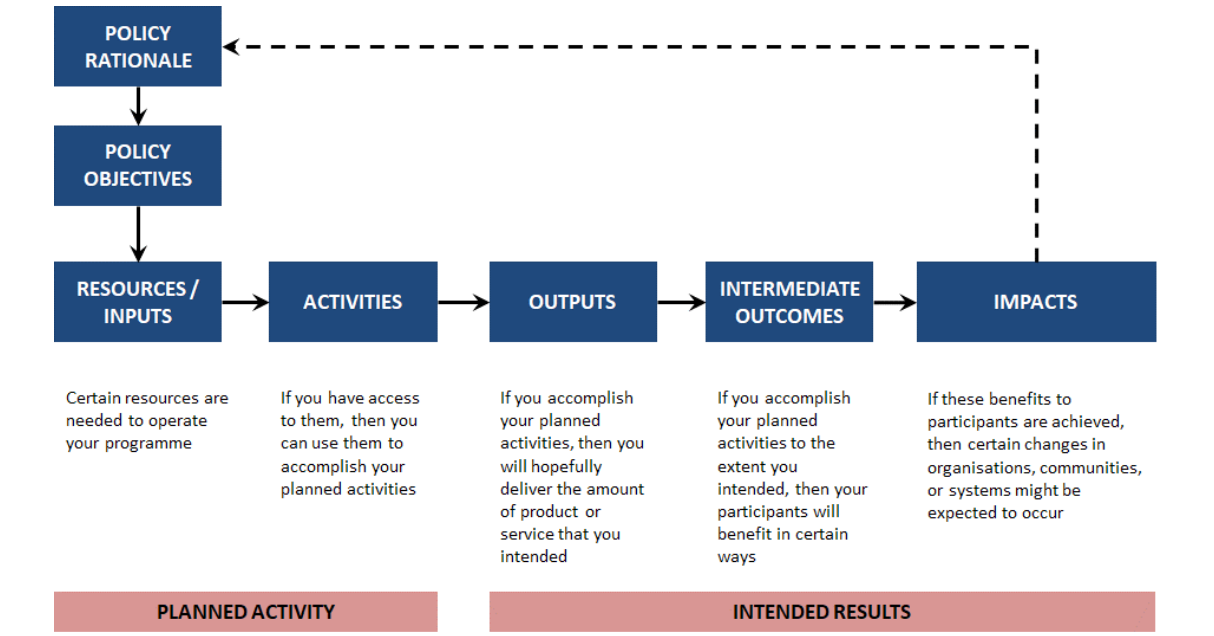
2.1 Evaluation frameworks

"Evaluation is an objective process of understanding how a policy or other intervention was implemented, what effects it had, for whom, how and why" (HM Treasury, 2011). It seeks to ask questions such as:

- How was the policy delivered? (process evaluation)
- What difference did the policy make? (impact evaluation)
- Did the benefits of the policy justify the costs? (economic evaluation)

To address these types of questions many evaluators will adopt a 'logic model' to help them understand the potentially complex relationships between the policy intervention and the realisation of positive effects on the targeted population. The most widespread logic model was popularised by the Kellogg Foundation and distinguishes the planned inputs and activities, and the intended outputs, intermediate outcomes and impacts expected from the policy (Figure 2).

Figure 2 Logic model



Source: adapted from Kellogg Foundation (2004)

The logic model crucially seeks to provide an intervention logic that clearly describes the theory, assumptions and evidence underlying the rationale for the policy. It does this by setting out the key issues being addressed and the context within which the policy is being developed, and by identifying and linking the intended outcomes (short and long-term) with the policy inputs and activities. Critically, it should also set out the assumptions made about how the different elements link together to enable the programme to successfully progress from one element to the next (HM

Treasury, 2011). In addition, the logic model needs to be guided by a clear definition of *who* is being targeted by the policy intervention – i.e. the target group(s).

Key advantages of developing logic models include helping to:

- Guide reviews and collection of existing evidence and data, highlighting areas of deficiency which require new evidence and data to be generated
- Inform evaluation objectives and the development of research questions
- Guide data collection and monitoring processes to ensure the right data is collected
- Identify possible unintended consequences
- Provide a transparent assessment framework within which existing evidence and any evaluation results can be combined to inform subsequent policy development

2.1.1 Rationale for funding: moving beyond market failures to system failures

In thinking about how to assess the impacts of KE-S funding, it is important to ground our understanding of why such policies and funding programmes are needed in an appropriate theoretical and conceptual framework. This sub-section first considers the rationale that has historically underpinned KE funding before exploring the potential rationale for a more education and student-focused element of the funding that could be consistent with the OfS mission.

Historic rationale for KE funding

Until now the development of KE funding has been grounded in an innovation systems framework. A central implication of this approach is to expand the basis of policy intervention beyond the standard 'market failure' approach to include 'system failures' (Crafts and Hughes, 2013; Hughes et al., 2011; Hughes and Martin, 2012; Hughes and Ulrichsen, forthcoming).

Traditionally R&D and innovation policies are justified through an assessment of the existence of failures in the price and market mechanisms which lead to underinvestment by the private sector in these activities. If markets were working perfectly then there would be no need for government intervention. Perfect in this context would mean that all costs and benefits are fully reflected in market prices. This would require no spillovers into the rest of society (costs and benefits to others arising from the firm's actions that are not reflected in the market price). In addition, consumers and producers can have no monopoly or other powers to distort markets. They also have perfect (full) information not only about current production and consumption possibilities but also of all future possible contingencies so that they can make perfect decisions.

In the context of R&D and innovation, market failures include the difficulty of firms to appropriate the full value of their expenditures on these activities, or from investing in collaborative linkages with, for example, universities (Hughes et al., 2011). In addition, high uncertainty in returns to R&D and innovation investments, and the inability of financial markets to price uncertainty can lead to capital market failures in the supply of finance for innovative activity (Hughes and Ulrichsen, forthcoming). These market failures need to be 'corrected' and provide the focus for government intervention.

A conceptual problem with this approach is that the conditions which cause these market failures and thus need to be eliminated, are precisely those that characterise the research and innovation process. As Dodgson et al. (2011, p. 1146) note:

> "*The problem that now arises is that these "failures" are an intrinsic consequence of the process of innovation itself and could only be eliminated if innovation ceased. Thus the model of perfect competition in a stationary state, a world in which innovation, or indeed any change of human knowing is absent, can serve only as a distorting mirror in which to reflect the innovation policy problem ... "[on the contrary]" ... a knowledge driven economy cannot be stationary ... competition is therefore a process of disequilibrium dynamics not a state of equilibrium affairs.*"

To overcome these issues, innovation policy scholars have increasingly focused on innovation systems theories to shape their approaches. This enables policymakers to adopt a more holistic view of the innovation process and where problems may arise that hinder the achievement of innovation outcomes.

An innovation system is usually analysed in terms of three core elements. The first of the three core system element consists of the *agents* whose behaviour takes place within the system. Agents include individual consumers, private sector businesses, and public private and third sector organisations. The second element is the *institutional framework* within which activities occur and which shapes agent behaviour. This encompasses 'hard' institutional elements such as contract, labour, and intellectual property law, and standards and regulation, as well as 'softer' informal norms and rules of the game governing agent interactions such as culture. The third element is the set of *interactions* between agents that take place within the institutional framework. These interactions go beyond arms-length market interactions to include the full set of formal and informal network and collaboration-based interactions. These interactions in turn take place within specific sets of physical (e.g. transport and IT) and science-based infrastructures provided by private and public sector agents.

It is important to note that the concept of innovation systems employed in the literature is not mechanistic. Rather it is organic with innovation systems constantly evolving. A well-functioning economy will therefore have transient innovation systems in the sense that they form and reform as innovation problems and conditions change. From this perspective an innovation policy, such as KE funding, that facilitates adaptability in innovation processes is particularly important (Hughes et al., 2011).

The systems approach thus adopts a much more holistic view of the innovation process and the functioning of the system within which innovation takes places. It recognises that failures can emerge in different parts of the system which cause blockages and hamper the process of innovation. Should the market mechanism not be able to remove or ease these blockages, then government intervention is required. Failures could be linked to: the inter-related and co-evolving nature of the agents and their capabilities; the physical, and science and knowledge infrastructure in which agents interact; the institutional framework which governs those interactions; and the network structure of the system (see e.g. Carlsson and Jacobsson, 1997; Edquist, et al., 1998; Grillitsch and Trippl, 2018; Johnson and Gregersen, 1995; Malerba and Orsenigo, 1997; Smith, 1999; Woolthuis et al., 2005).

In the context of KE and the realisation of socio-economic impacts from investments in the university system, common system failures identified include (Hughes et al., 2011; Hughes and Martin, 2012; Hughes and Ulrichsen, forthcoming; PACEC/CBR, 2009):

- *Institutional failures* arising from, for example, different norms and values governing agent behaviour operating in academia and the private sector. This can result in interactions not forming, difficulties in collaborating even once formed, and problems exchanging and absorbing knowledge for productive gains
- *Network failures* arising through sparse or missing linkages between agents. This hampers the development of mutual learning and awareness of complementarities within the system, and limits the diffusion of best practice
- *Agent capabilities failures* that constrain the ability of the system to adapt or adopt new product and process technologies, new organisational innovations or to respond to new opportunities
- *Lock-in failures* with agents in the system suffering from 'opportunity blindness' and fail to identify new possibilities or move away from pre-existing system configurations. This can arise because of huge sunk costs in particular sectors and technologies alongside the necessary complementary infrastructure, institutions and networks associated with them

Appropriately deployed, KE funding can help address these types of innovation system failures.

A potential education and skills policy rationale for KE funding

In moving forward and reflecting on the role and importance of the DfE contribution to HEIF, one has to more explicitly consider education and skills related rationales for KE funding.

Perhaps the most dominant framework for developing a rationale for education policy is through the lens of economic utility and human capital (Bell and Stevenson, 2006). Human capital in this context is the "skill, knowledge, and similar attributes that affect particular human capabilities to do productive work" (Schultz, 1977). With the transition of many advanced economies towards knowledge-driven production, the dominance of this approach has intensified. At its core is the importance of developing an appropriately and highly skilled labour force to meet the competitive needs of economic agents competing in markets, improving productivity, allocating scarce resources more efficiently, and unleashing the creativity underpinning innovation; i.e. driving increased and sustained economic growth and prosperity. At the individual level, theory suggests that human capital shapes their earning potential and career opportunities, but that individuals can have broader objectives beyond their future earning potential for investing their time and effort in education and training (e.g. status, sense of accomplishment etc.) (Bell and Stevenson, 2006).

In terms of the rationale for government funding of higher education, from an economic perspective, it is often seen as exhibiting elements of a public good (can be consumed by any number of people without being depleted, and where the benefits cannot be confined to the individual recipient – here the student – but rather accrue more broadly to society as a whole). Economists have highlighted the benefits of having a well-educated workforce for enhancing economic growth (Romer, 2011). They argue that groups of well-educated people working together are more productive than if they were working individually with less educated groups (Williams, 2016). They suggest that the overall societal benefits to investments in higher education are greater

than the sum of individual private benefits (e.g. increased lifetime incomes and personal fulfilment). The mismatch between public and private benefits mean that users (for example individual students or firms considering investments in skills for their workforce) will tend to underinvest in education and skills development from a societal point of view, and justifies government investment. That said, people are increasingly arguing that higher education also exhibits characteristics of a private good in that, while knowledge once produced can be available to all, acquiring and exploiting it can be very costly for the recipient (i.e. it is not a free good) (Williams, 2016) raising questions about where the line should be drawn between education as a public vs private good.

In addition, and perhaps more relevant for KE-S funding related policies from an education and skills perspective are insights from the innovation systems perspective on the rationale for supporting KE targeting students and education- and skills-related activities. Central to the innovation systems perspective is the need to remove barriers to the generation, diffusion, and uptake of knowledge around the system. One barrier is the mismatch between the skills needs of the labour market and the skills emerging from education providers. This includes not just specific technical skills, but also the broader sets of skills and capabilities that are believed to underpin creativity, innovation and entrepreneurship (OECD, 2012), and the ability of agents in the system to adapt to changing technological and innovation regimes. Related to this is the inertia in the system hampering changes to the provision of education to changing needs of users. In addition, there can be significant search costs incurred by recipients of education in identifying providers, or by firms in identifying potential employees. There can also be a cultural aversion within the student population and other barriers (e.g. availability of finance and support) to engaging in particular types of career paths which may nevertheless be valuable, such as setting up their own business.

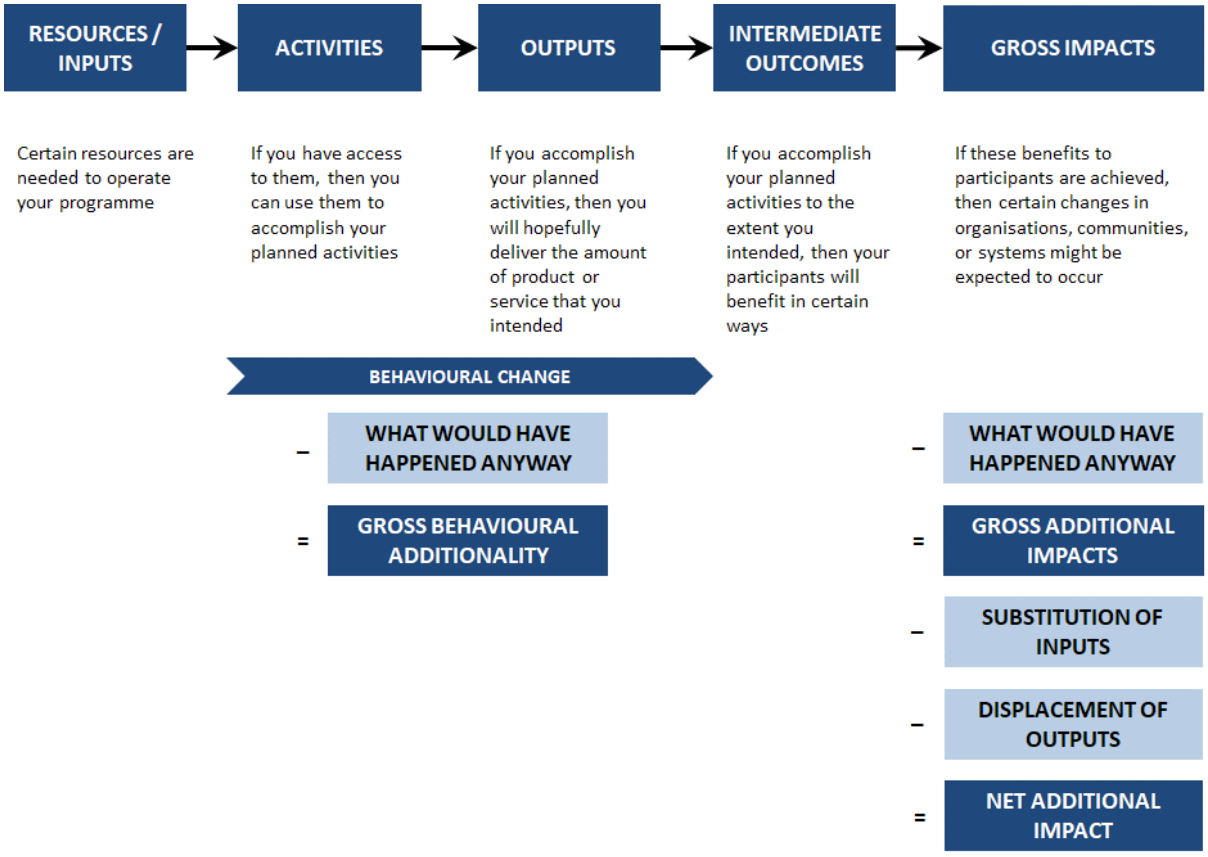
In principle, KE-S funding could help to address these variety of barriers in the system, for example by strengthening the direct link between education providers and users in the system with an understanding of future skills needs thereby increasing the responsiveness of the education system to changing skills needs; exposing students more directly to employers throughout their time education can help to reduce the search costs of matching students to appropriate jobs; and helping students develop the broader entrepreneurial and innovation-related skills, capabilities and experiences beyond the technical skills gained through their courses. In addition, the existing provision of courses and training for the existing workforce enabled by KE funding helps to address the market failures associated with firms' willingness to invest in training.

While there some obviously distinct differences between an R&D and innovation-focused rationale for KE funding, there are important overlaps. These include around the development of capabilities that will underpin the ability of innovating agents in the system to efficiently and effectively develop, diffuse and deploy knowledge to productive uses generating socio-economic wealth for the nation. This includes the building of entrepreneurial, collaborative and creative capabilities of individuals involved in these processes. In addition, a key motivation for HEIF in the earlier rounds was to effect culture change among the academic community to legitimise KE as an activity within HEIs. This could extend to the student population. Similarly, the R&D/innovation systems perspective focuses critically on enabling the effective flow of knowledge around the system. This includes not just new knowledge generated through research but also encompasses the *mobility of individuals* carrying this knowledge (including new graduates entering the labour market as well as existing employees moving jobs).

2.1.2 Assessing impacts, additionality, and policy performance

A critical part of any impact evaluation is to assess whether the policy intervention has generated impacts that would not have occurred if the intervention had not been made – i.e. that any changes to the system have been *net additional*. This requires not just finding ways of capturing the nature and scale of impacts generated, but an attempt to attribute any changes to the policy intervention. Assessments therefore need to be made of the counterfactual of what would have happened in the absence of the policy intervention (deadweight); substitution and displacement effects (positive effects on inputs and outcomes offset by negative effects elsewhere); and any leakage effects (benefits to non-target groups). This is shown in Figure 3.

Figure 3 From gross impacts to net additional impacts



Source: adapted from Hughes et al. (2011)

The rise of innovation systems thinking in conceiving of the rationale for public intervention in support of innovation has important implications for how policies are evaluated. In particular it suggests that studies need to move beyond the traditional focus of impact evaluations on establishing net input and outcome additionality, to include notions of behavioural additionality – assessments of changes to the behaviours of the target group(s) (Hughes et al., 2011). In the context of KE funding, this could be the organisations involved in the process (the non-academic organisations and the HEI) as well as the individual employees, academics and students involved. In addition, studies should also focus on the extent to which policy interventions are helping to ease blockages in the system and enable knowledge to diffuse and be deployed more effectively (Molas-Gallart et al., 2016).

The counterfactual is, by definition, unobservable, and variety of strong assumptions are typically required to make reliable estimates of it. A variety of methods have been developed to assess the counterfactual of what would have happened anyway (HM Treasury et al., 2012). Many focus on identifying suitable control groups and comparing changes to the 'target group'. The gold standard is considered to be randomised control trials (RCTs) (similar in construction to those in clinical trials for drugs) but these are typically not possible in many forms of innovation policy interventions. Where RCTs are not possible attempts can be made to develop quasi-experimental designs that match the intervention group to a counterfactual group matched based on non-policy factors known to be relevant to the outcome. Alternatively, difference-in-difference approaches do not involve direct matching of intervention groups to control groups but rather compare groups where there is strong evidence that outcomes for the two groups moved in parallel prior to the policy intervention.

Once estimates of impacts have been obtained, it is typical to then convert these into measures of policy performance such as cost-benefit ratios, or cost-effectiveness calculations. This is achieved by working out the monetary value of the estimated impacts and comparing it with the estimated costs of the intervention. Cost Effectiveness Analysis (CEA) compares the total quantity of the direct outcome or impact generated with the cost of generating it, for example the 'cost per job created' or 'cost per premature births averted'). Cost Benefit Analysis (CBA) goes beyond outcomes to seek to fully monetise both the full set of net additional benefits (including the direct and wider indirect socio-economic benefits arising from the intervention) and compare these against the full costs. It also seeks to adjust for the time value of money in comparing the net present value of benefits to that of the costs.

If strong empirical evaluation designs are not possible, one has to turn to weaker evaluation designs (HM Treasury et al., 2012), including:

- comparing intervention groups to unmatched comparison groups where there is also no strong evidence that the groups historically moved in parallel prior to the policy intervention
- comparing predicted and actual outcomes – a long time-series can help to improve reliability
- before and after comparison of the intervention group alone (comparison to a baseline) – this is particularly weak if there is only a single point estimate of the baseline at the start of the policy.

Used in isolation these generate less robust evidence on policy performance (HM Treasury et al., 2012). Evidence will thus need to be triangulated through multiple and often mixed qualitative-quantitative methods (Hughes and Martin, 2012) as was the case for the evaluation of HEIF (PACEC/CBR, 2009; Ulrichsen, 2015a).

Indeed, it is fully accepted within the Magenta Book guidance that in certain circumstances – such as those confronting many KE and innovation policy evaluations – it may be appropriate to restrict the scope of evaluations to shorter, simpler links in the logic change – i.e. focus on process changes in the system. It acknowledge further that detailed evaluations of changes in very complex systems may only be possible through theoretical evaluation (understanding, testing and refining assumed connections between interventions and anticipated impacts) or simulation modelling.

Indeed Hughes and Martin (2012, pp. 17–18) note that:

"*The circumstances in which an empirical evaluation of the value for money or rate of return is deemed feasible depends on the cumulative nature and scope of the public support and the possibility of identifying a counterfactual to compare the actual situation with*.

If the relationship between final outcomes and the policy interventions are complex or 'distant' with many potential confounding factors, then a quantitative empirical impact evaluation is significantly less feasible. The same will be true if the effects build up gradually over an extended period of time. Similarly, impact evaluation will prove difficult where the policy or activity involved itself represents a consolidation of a range of potential policy interventions that have accumulated over time.

Finally if the policy is being widely applied to a class of economic actors (e.g. the whole of the university sector), then difficulties will arise in identifying suitable counterfactuals. In these circumstances the bulk of the evaluation activity will necessarily focus on process evaluation and intermediate outcomes (see, for example, HM Treasury, 2011, p.101)."

KE funding programmes present many of these challenges, notably an often complex relationships between the inputs and outcomes/impacts, long time-lags between investments made and impacts realised, the significant uncertainties associated with this conversion (outcomes and impacts are heavily skewed with many attempts failing due to the nature of innovation), and the role and importance of complementary assets – many of which may be beyond the control of the public sector – that need to be developed and deployed alongside the core outputs in order for the impacts to be fully realised. This makes estimations of the full suite of benefits and monetising them, let alone attributing any changes to the policy intervention, incredibly challenging and resource intensive (Hughes et al., 2011; Hughes and Martin, 2012). In addition as HEIF is applied to the much of the HE sector, coupled with the way it is allocated, makes identifying strong control groups almost impossible and estimating counterfactuals very difficult.

The value of evaluations of such funding programmes will therefore be on understanding the rationale and empirical support for the links between the different stages of the logic model, and the mechanisms and pathways associated with them. Focusing on these issues is at the core of a systems-based approach to innovation policy analysis and evaluation being advocated by a number of research evaluation scholars (Hughes et al., 2011; Hughes and Martin, 2012; Hughes and Ulrichsen, forthcoming; Molas-Gallart et al., 2016).

In addition, given the nature of KE-S and the challenges for evaluations described above, assessments of impact will necessitate mixed methods approaches that bring together different forms of quantitative and qualitative evidence. This would combine empirical assessments of impacts and changes to the innovation system where possible, with more narrative-driven approaches that seek to qualitatively assess those impacts and system changes that are difficult to quantify and monetise. Indeed, such mixed method approaches reflect the state-of-the-art in the research evaluations. Donovan (2011) in reflecting on the views of leading contributors to the field of research impact assessments concludes that:

"*Metrics-only approaches employing economic data and science, technology and innovation indicators were found to be behind the times: best practice combines narratives with relevant*

qualitative and quantitative indicators to gauge broader social, environmental, cultural and economic public value" (Donovan, 2011, p. 175)

2.2 Monitoring

Monitoring data can play a key part in policy evaluation, by providing useful data to policymakers through the life of the policy. It can support not just the routine management of the policy but also develop data to feed into evaluations (HM Treasury, 2011). The Magenta Book highlights types of monitoring data typically collected and how it can fit with the logic model

Table 1 Types of monitoring data collected

Data	Example	Why collect this data?
The people accessing a service	Numbers and characteristics	This can help demonstrate whether a policy is reaching its target population
Inputs	Funding or staff numbers	This can inform a cost-benefit analysis and determine whether assumptions about the policy implementation, such as cost and time, were correct
Processes / activities	Referrals and waiting times	This can help determine whether the policy is being implemented correctly or whether there are any unintended consequences
Outputs	Numbers of people getting job interviews or number of applications processed	This can inform an assessment of whether the programme has delivered the target outputs to the anticipated quality
Outcomes	Employment rates and wages	This will help to measure the benefits of delivering the outputs

Source Magenta Book (HM Treasury, 2011, p. 70)

While monitoring data is often administrative, there is nothing to stop policymakers from adapting it, or collecting additional data as part of any administrative process, to ensure it can also support evaluations (HM Treasury, 2011). This emphasises the need for monitoring systems and evaluation plans to be co-developed at the policy design stage.

The Magenta Book highlights a number of ways in which monitoring data – if of sufficient quality – can support evaluation. These include:

- Informing the development of different stages of the logic model, for example on the nature and scale of inputs, activities and outputs. Where outcomes are likely to take a long time to materialise but achieving them is known to depend on a sequence of prior steps, monitoring data can provide evidence of whether these earlier and intermediate steps are developing. Evidence of failure to develop these intermediate stages can provide early warnings of policy failure
- The progress of policy against pre-specified expenditure or output targets
- Whether the policy is reaching its target population (e.g. by collecting data on the uptake of the policy)
- The costs of the policy (including e.g. costs to other stakeholders necessary to engage)

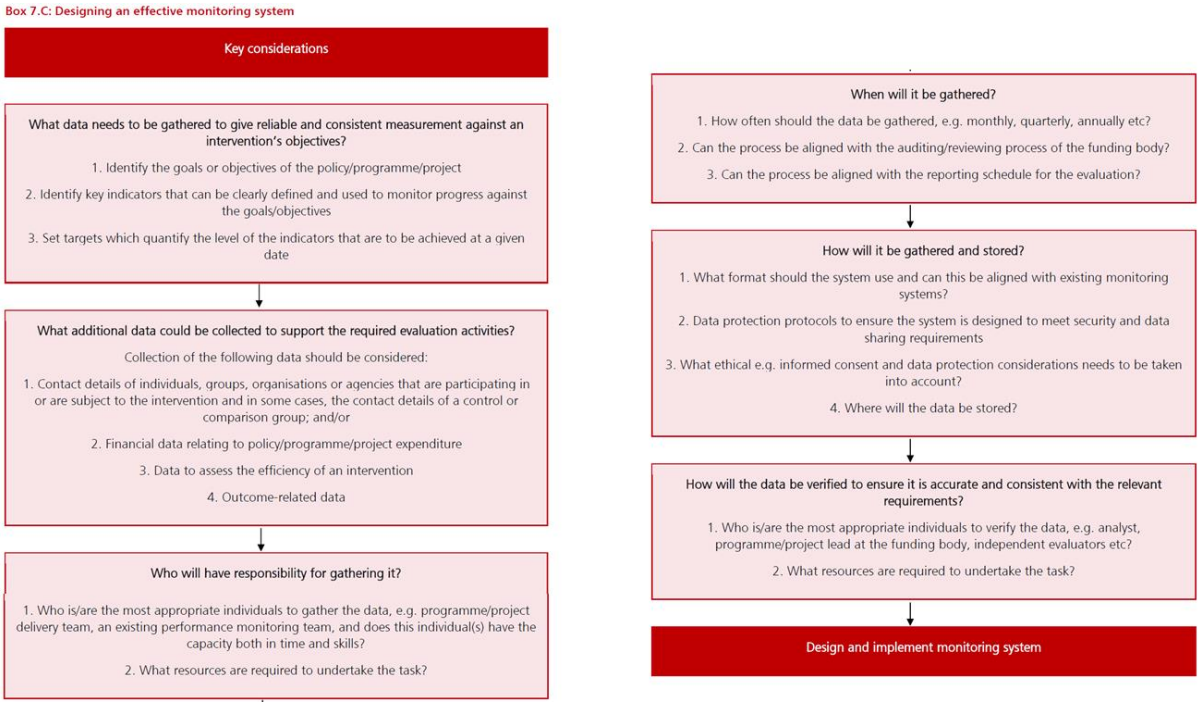
- The impacts and effects of the policy. Often monitoring data will be able to provide information on the gross impacts or system changes achieved but may need supplementing with additional data to move towards assessments of additionality

Crucially monitoring data can help policymakers identify where policies are not being implemented as expected and further action is required to ensure it will meet its objectives.

In addition, where routine monitoring data has the potential to fulfil some or all of the data requirements for planned evaluations, policymakers have the advantage reduced costs and reduced intrusion on the operations of users in collecting additional data.

Figure 4 sets out guidance from the Magenta Book for developing effective monitoring systems. I would suggest that robust data on inputs, activities and outputs should also be part of the data collection system.

Figure 4 Designing an effective monitoring system



Source: Magenta Book (HM Treasury, 2011, pp. 75–76)

The discussion above provides the important overarching framework with which to consider what types of evidence and data exists, and where new data should be collected either as part of an ongoing monitoring process or as part of commissioned evaluations. The report now turns to the specific case of KE-S funding.

3 Defining the scope of student-focused knowledge exchange funding

One of the most important challenges that needs to be addressed as part of developing methods for assessing the impact of KE-S funding is to define clearly and precisely what we mean by KE-S and hence the scope of the policy intervention (e.g. the target audience, appropriate objectives, eligible activities and expected outcomes).

To aid this discussion, it is helpful to take a step back and be clear about what knowledge exchange is, who is involved, and what is known about how different stakeholders benefit. This will allow us to more clearly reflect on the scope of KE-S and how it is distinct from other forms of KE. It will also help us to reflect on how KE-S activities differentiate themselves from those student-focused activities of HEIs that should be funded through other funding programmes or sources of income (such as tuition fees).

3.1 Defining knowledge exchange

HEIs are a key part of the knowledge generating and educational infrastructure of a nation. They are playing increasingly important roles in addressing a wide range of innovation and broader socio-economic challenges and in addressing the UK's productivity challenge. Traditionally (at least since the second world war) their core functions revolved around generating new knowledge through research and educating students that would form the next generation of the labour force and a more knowledgeable society. Some research activities led to novel technologies and processes being developed and commercialised. However, the primary diffusion channels for new knowledge were through scholarly publications and the movement of students into the labour market, and interactions with firms and other non-academic organisations were largely ad hoc and driven by the individual academic.

The past twenty years or so has seen the emergence of a more strategic focus for English universities on developing more *direct* linkages with organisations in order to develop, diffuse and apply knowledge in order to achieve socio-economic outcomes.

For over a decade in England these *knowledge exchange* linkages have been defined as those more direct, *knowledge-based* interactions between HEIs and non-academic organisations (such as firms, public sector agencies and bodies, charities, community groups etc.) which result in benefits to the economy and society. Knowledge can move in either direction hence the focus on 'exchange' rather than one-way 'transfer'. And while it is useful and important to distinguish KE *activities* from the core research and teaching activities, they are fundamentally shaped by the knowledge generated and held by HEIs, or accessible through them (e.g. through collaborations). In essence, KE provides the more direct linkages between the HEI and the wider world through which to develop, diffuse and deploy knowledge to achieve a variety of socio-economic outcomes.

The focus of HEIF reflects this very broad interpretation of KE, with its primary objective in the most recent round being to support: "*KE activities with all forms of external partners – businesses, public and third sectors, local and community bodies and the wider public – to achieve the maximum economic and social impact for this country. Partnerships may be local, national or international. This includes support of staff and student entrepreneurship.*" (HEFCE, 2016, p. 7).

I now turn to the types of KE activities, the types of agents involved in the process, and what we know about who benefits – directly and indirectly from KE.

3.2 Types of knowledge exchange interactions and the agents involved

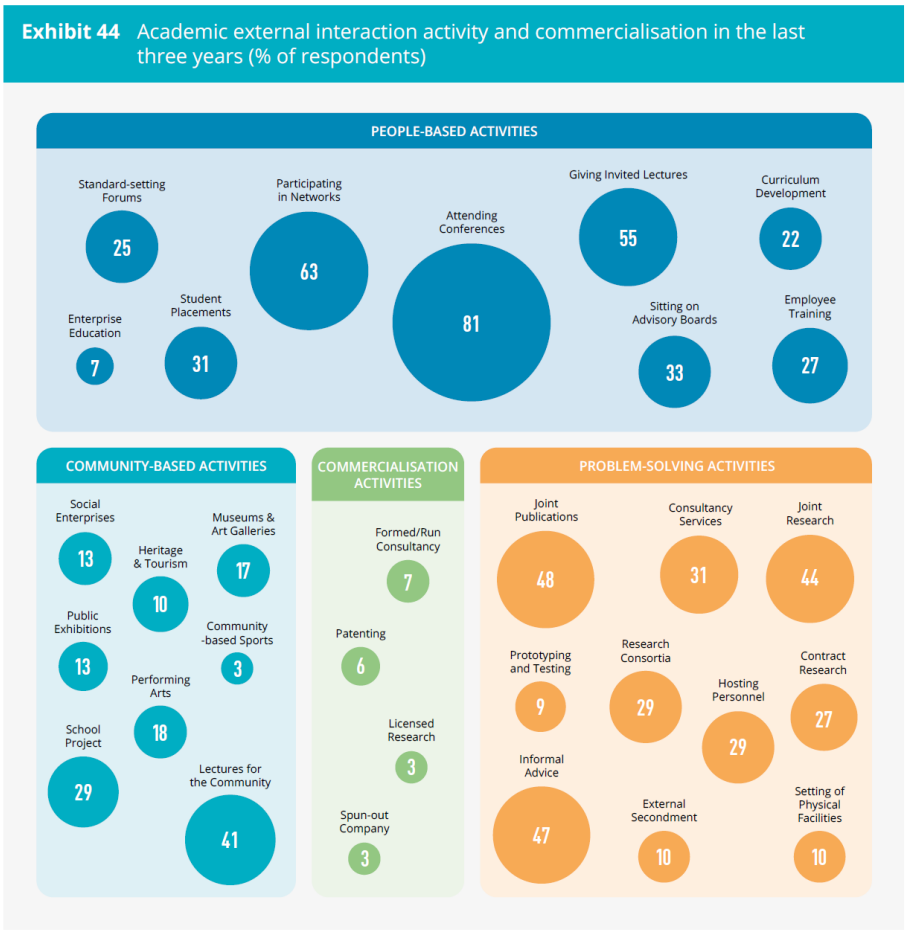
Studies have highlighted the many types of KE interaction that form between universities and non-academic organisations (Abreu et al., 2009; Hughes et al., 2016; Hughes and Kitson, 2012; PACEC/CBR, 2009). They include: contract and collaborative research; provision of consultancy and

testing services; commercialisation of intellectual property through licensing and spin-out companies; student and social enterprise; workforce development and training; provision of facilities and equipment services; hosting industrial visitor and external secondments; student placements; industrial involvement in curriculum development; and many more. While many KE mechanisms are transactional and involve a formal contract, some do not. For example the provision of informal advice is frequently cited by academics as a key mechanism of KE.

It is important to recognise that there are different agents involved in the process of delivering these different KE activities. Most often discussed in the public and policy discourse over KE are those interactions that form between the academic community and non-academic organisations in the private, public and charitable sectors. However, studies have also highlighted the importance of KE activities involving the student population (PACEC, 2012; Ulrichsen, 2014). This includes activities such as student enterprise, and involving industrial partners in the curriculum. These studies also suggested a growing trend within English HEIs to involve students in other forms of KE more traditionally associated with academic-driven activity, such as creating opportunities for students to provide (supervised) consultancy to address problems faced by local businesses. Indeed, these studies also suggested that student-focused KE was of growing importance in HEIs' KE agendas.

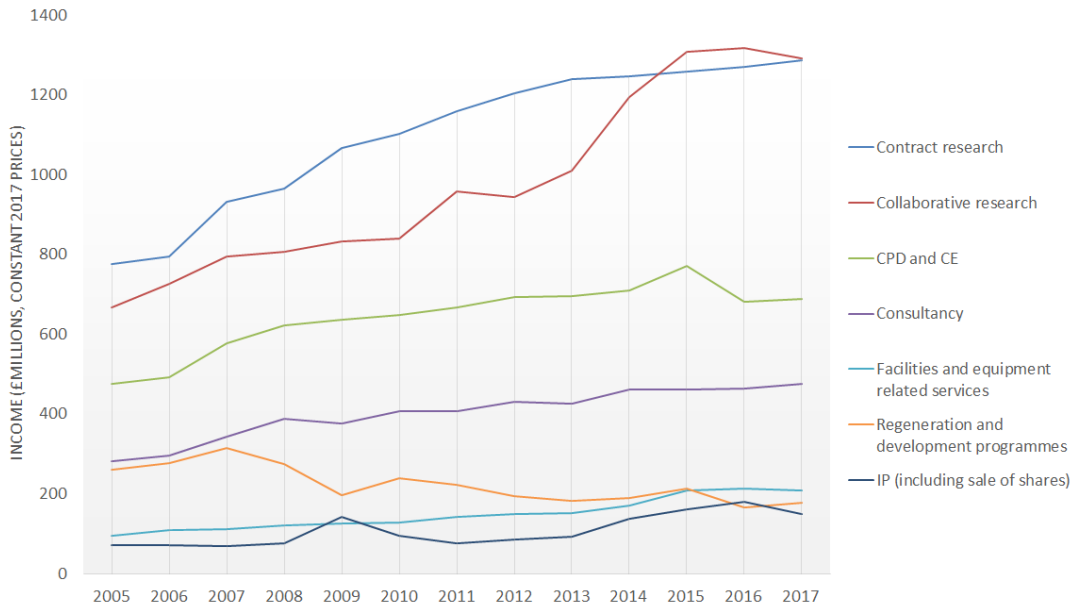
There are a different categorisations of these mechanisms. A commonly used one in the UK is shown in Figure 5. This groups mechanisms into problem-solving focused KE activities, people-based activities, commercialisation activities, and community-based activities. However, few studies of this type have sought to systematically distinguish the balance of involvement between academics and students as the HEI-based agents involved in the process, other than where it is obviously so (e.g. around student enterprise or student placements).

Figure 5 Types of knowledge exchange interaction



Source: Hughes et al. (2016)

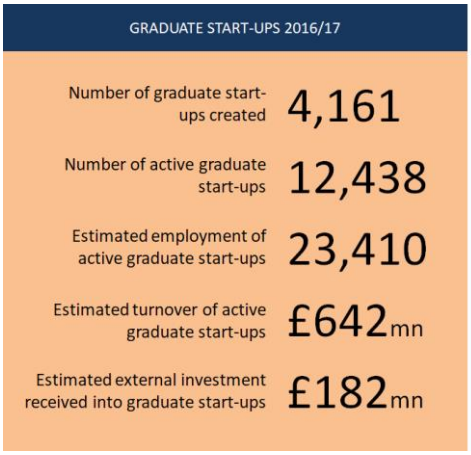
Figure 6 Knowledge exchange income by mechanism, 2004/5 – 2016/17



Source: HEBCI surveys 2004/05 – 2016/17

The Higher Education Business and Community Interactions (HEBCI) survey, set up by HEFCE in the early 2000s, systematically collects data on KE on an annual basis from all HEIs in the UK. It covers a subset of all interaction types and focuses primarily on those involving a monetary transaction. Trends in the income received from the mechanisms included in HEBCI are shown in Figure 6. HEBCI also provides information associated with number of graduate start-ups that have received some form of formal business/enterprise support from the HEI. However, questions remain as to the robustness of the data on this topic due to the difficulties in tracking companies started by graduates (PACEC, 2015b).

Figure 7 Knowledge exchange income by mechanism, 2004/5 – 2016/17



Source: HEBCI 2016/17

A drawback of the HEBCI survey, however, is that it only provides information at the institution-level. Therefore, even if it could be reformed to capture the degree of student involvement in different types of KE, it would say little about how individual students can benefit from exposure to, or engagement in KE.

At the time of writing of the report (February 2019) a data source that provided information at the student level is the Destination of Leavers of Higher Education (DLHE) survey. The DLHE surveyed graduates 6 months after graduation and asked whether they have set up their own business. 2015/16 data suggested that 1,285 graduates did so (0.6% of UK domiciled leavers). The downside of this data point is that there is no presumption that the start-up was in any way connected to activities gained during the student's time at the HEI, nor whether they received any support from the institution. The DLHE has now been replaced by the Graduate Outcomes Survey (GOS) which surveys graduates 15 months after graduation. Like the DLHE it asks them about whether they have started their own business. It helpfully asks additional questions on the nature of these businesses including whether they have employees or not, the motivations for pursuing this type of work opportunity, and helpfully, how the business or company is being funded, and seeks information on key graduate outcomes (including salary as well as well-being).

PACEC (2015b) reviewed the robustness of HEBCI and DLHE survey data on student enterprise activity given the significant differences between the two. They suggest differences were partly due to the definitions used to collect the data. They also found that the generation of HEBCI data on graduate start-ups typically required considerable estimation making it less reliable. Another

drawback of HEBCI data is that it is collected at the institution level. This therefore only allows for institution-level activities and effects to be examined. The DLHE survey does, in principle, allow for more student-focused analyses to be undertaken, albeit with limitations if other student-level data cannot be linked to it.

Another source of evidence on the nature and scale of student enterprise and entrepreneurship, and support for this activity, is the National Centre for Entrepreneurship in Education (NCEE) who historically ran surveys of this specific form of KE-S. However, it appears as if this exercise was last undertaken in 2012. Nevertheless it can provide background evidence on which to draw. For example, the 2012 survey (NCEE, 2012) showed that:

- 18% of students were engaged in some way in student enterprise and entrepreneurship
- Almost all HEIs provided some support for this activity
- 85% of all reported funding for this activity comes from public sources, with HEIF the primary source

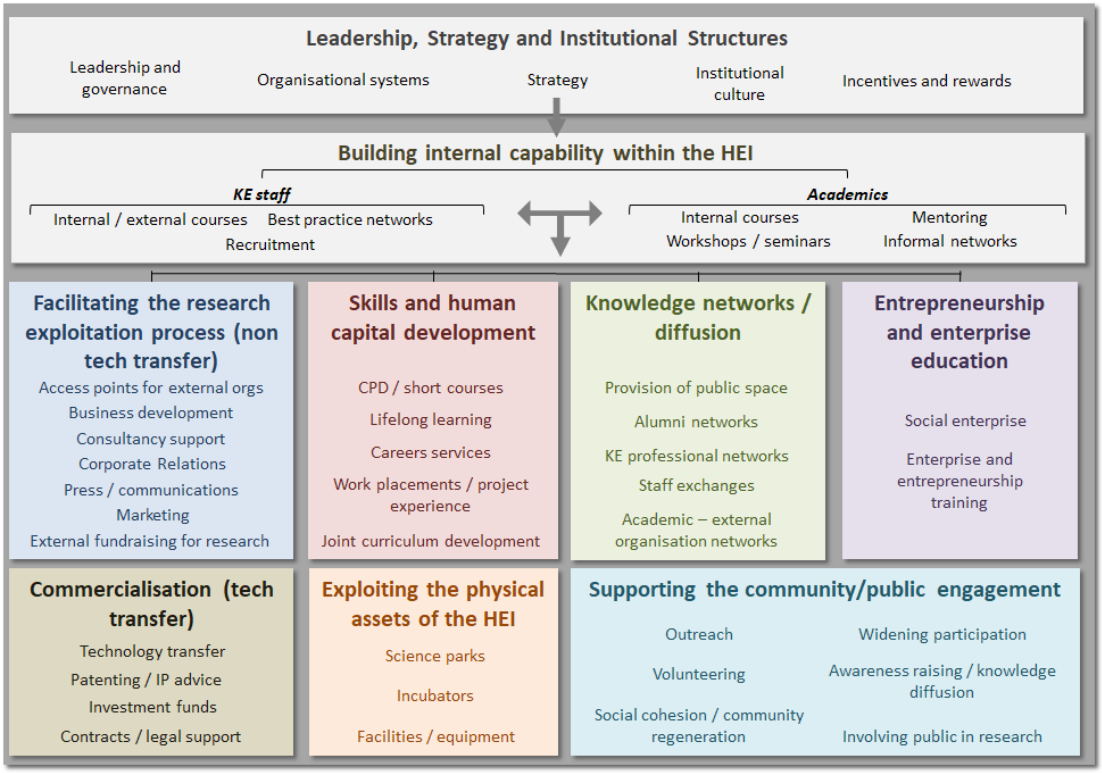
The HEBCI survey also provides further information on a number of teaching and student-related KE activities, including:

- The types of continuing professional development being provided by each HEI, covering: distance learning, continuous work-placed learning, short bespoke courses for business on campus; short bespoke courses at business premises, and extra-mural courses for the public.
- The extent to which employers are actively engaged in the development of content and regular reviewing of the curriculum

Research England also currently collect information on the focal areas of support for KE being invested in and established. The framework was developed by PACEC/CBR (2011) and subsequently by Ulrichsen (internal publication for HEFCE), based on an analysis of the variety of support being put in place by HEIs to facilitate different types of KE (Figure 8). This framework has guided the collection of data in recent HEIF strategies – requested by Research England as part of the funding allocation process – on how HEIs allocate their funding to support different types of KE. This also provides a mapping between these categories and the HEBCI defined KE mechanisms.

Overall, the existing data relating to KE provide limited insights into KE-S activities, other than where it is obviously so (e.g. around student enterprise or student placements). They were not set up to capture the internal communities within an HEI involved in the process. This makes it difficult to accurately segment existing data on KE into those mechanisms which are student-focused and those which are not. Inevitably there will be many bring together both research and teaching capabilities and assets, and involve both academics and students, to address needs in the economy and society. Perhaps the most challenging will be the rise in the number of multi-mechanism strategic partnerships being formed between large organisations and HEIs. This would be an area where significant developments would need to be made to improve our ability to assess the impacts of KE-S funding. Data collection systems may well need to be revisited to enable better insights to be developed on the extent of involvement of the student in KE processes, and those that explicitly seek to advance student-related outcomes.

Figure 8 Focal areas for knowledge exchange support



3.3 Education and skills-related outcomes from knowledge exchange

In thinking about the scope of KE-S funding and appropriate objectives, it is also important to reflect on *who* benefits, and the nature of these benefits. While much of the literature on KE focuses on understanding the nature and scale of benefits realised by the knowledge using partners involved (e.g. firms, charities, public sector agencies), some have considered how academics themselves benefit. In addition, while there is little direct evidence on whether and how students benefit, the evidence that does exist suggests that one would expect them to benefit, either directly or indirectly. This section explores what is known about education and skills-related benefits arising from KE, and how students may benefit from exposure to, or direct engagement in, KE.

A substantial body of literature has explored the variety of outcomes realised through KE. Table 2 (adapted from Ulrichsen, 2015b) brings together this literature and presents the breadth of areas where universities are known to contribute to strengthening the functioning of the innovation system. Developments in these areas enable organisations to generate increased added value for example by enhancing short and long term competitive advantage, increasing the value and profitability of their products and services, improving productivity, accelerating innovation processes, and accessing and developing new markets. These developments also allow the innovation system to function more effectively by creating more conducive system conditions to improve access to, and the diffusion, absorption and deployment of, knowledge by innovating agents.

Clearly the first category *developing skills and human capital* would be relevant to the OfS mission, as well as some outcome areas that seek to *strengthen the 'system' conditions for innovation* (e.g. the capability to engage in entrepreneurial activity, or working to attracting high skilled workers to

an area). In addition, the final category, *providing spaces for open-ended conversations and entrepreneurial experimentation*, focuses on the unique role of HEIs in innovation systems in providing so-called 'public spaces'. HEIs are typically stable institutions with relatively neutral environments in terms of political, industrial, and commercial agendas. These characteristics help to create a *conducive environment for catalysing interactions*, and may help to bridge disconnected or weakly connected actors in the innovation system and develop common interests, and may lead to more formal activities (Hughes, 2011).

Table 2 Diversity of outcome areas where universities contribute in the innovation system

Category	Outcome area
Developing skills & human capital	Developing a highly skilled labour force for the future (both generic/technical skills)
	Developing entrepreneurial / enterprise skills
	Enhancing skills of the existing workforce e.g. through workforce development & training
	Developing industry-responsive curricula
Developing & deploying knowledge / technologies for innovation & problem solving	Knowledge generation through user funded research / co-produced research
	Adding to the stock of codified knowledge e.g. through publications, patents, prototypes
	Transferring existing knowledge/know-how e.g. through consultancy, informal linkages
	Investing in & enabling access to, specialised infrastructure, instrumentation and equipment
	Providing technical assistance
	Commercialising new technologies through new venture creation & licensing
	Understanding industrial development pathways and market opportunities
Strengthening 'system' conditions for innovation	Providing leadership & expertise to inform policy/system development
	Strengthening local/system capabilities and capacity for entrepreneurship & innovation
	Supporting internationalisation activities of firms & attracting talent, investment, resources
	Developing infrastructure supporting innovation and economic growth
	Providing business assistance/support
	Strengthening other competitiveness conditions (e.g. regional quality of life)
	Facilitating access to finance for R&D and innovation
Providing spaces for open-ended conversations and entrepreneurial experimentation	Convening academics/industry researchers/innovators networks
	Supporting creation of industry identity
	Bridging disconnected actors in system
	Hosting and participating in standards setting forums
	Providing forums for potential investors
	Providing spaces with necessary support encouraging entrepreneurial experimentation

Source: Adapted from Ulrichsen (2015b)

The extent to which HEIs focus their KE efforts to contribute to these different types of outcomes is much harder to capture absent of qualitative investigations through interview or survey. One possible source of evidence could be through scrutinising KE-related investments to examine whether they focused on objectives consistent with, for example:

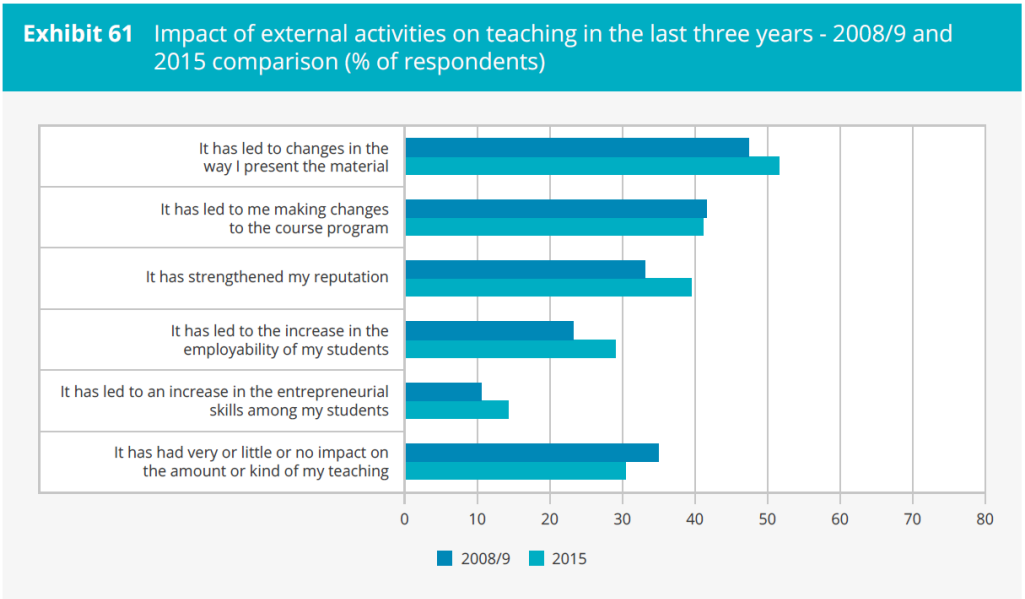
- The OfS mission to "ensure that every student, whatever their background, has a fulfilling experience of higher education that enriches their lives and careers"[2].

[2] https://www.officeforstudents.org.uk/about/our-strategy/

- DfE priorities where KE-related investments are likely to contribute, not least the focus on meeting the nation's skills requirements, and on retraining and adult learning.
- Priorities set out in the People chapter of the Industrial Strategy White Paper where KE-S could contribute, not least in reducing regional disparities in education and skills levels; improving technological capabilities to unlock more valuable opportunities for people over the longer term; and the shortages in STEM skills in the economy.

In addition to the more education and skills-focused KE outcomes, evidence suggests that students benefit from academics' engagement in KE through the spillover effects on their teaching activities. For example, a recent large scale survey of UK-based academics on the nature, motivations, and effects of KE sought to identify the impacts of KE on teaching activities and students (Hughes et al., 2016). It showed that around 45% of academics engaging in KE were motivated by the potential to gain knowledge about practical applications for teaching; and just under 40% believed it would help to create student placements and job opportunities. This survey also considered the direct impacts on teaching (Figure 9).

Figure 9 Impact of KE on teaching: evidence from the 2015 survey of academics



Source: Hughes et al. (2016)

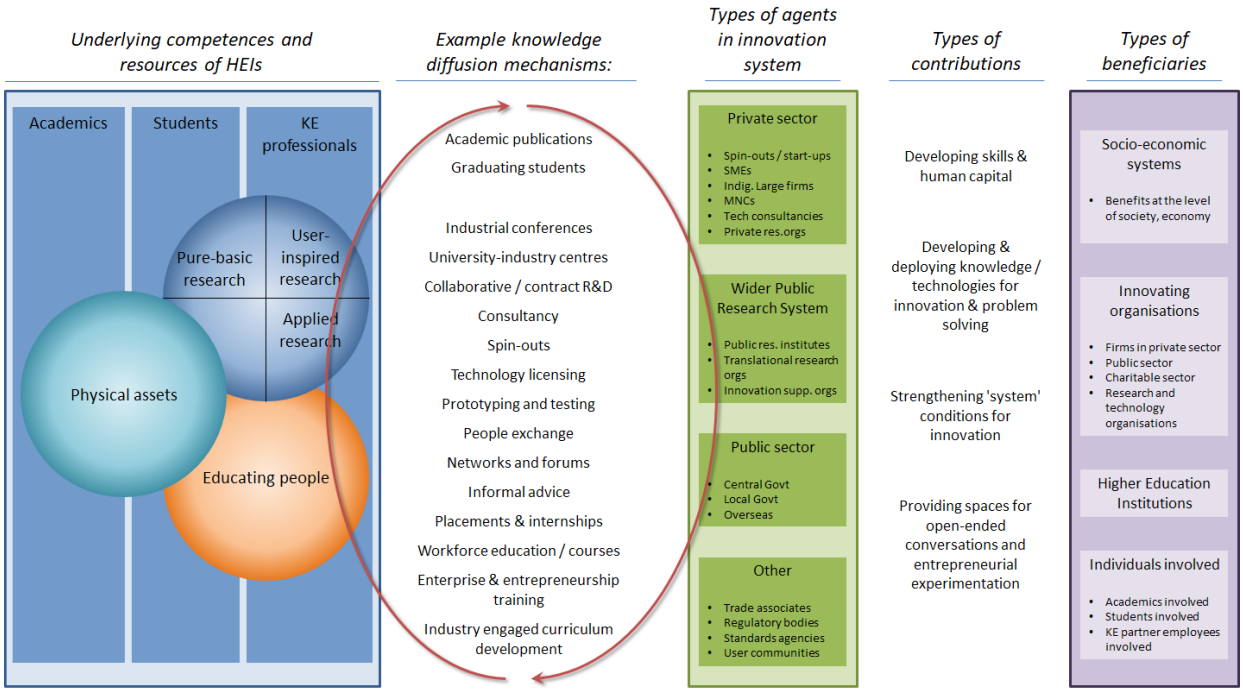
In addition, reviews of HEIF strategies have found that many HEIs believe there are significant benefits to student employability through exposure to KE (PACEC, 2012; Ulrichsen, 2014) and many see HEIF as playing a key role in enabling student enterprise and entrepreneurship. This importance of HEIF for many HEIs in underpinning this form of KE is consistent with the findings of the National Centre for Entrepreneurship in Education in their last survey on the topic in 2012 (NCEE, 2012) and a recent study by PACEC on the impact of HEIF on student enterprise outcomes (PACEC, 2015b).

Overall, however, direct and robust evidence on how KE activities impact on student outcomes was hard to identify other than in specific areas around student enterprise.

Figure 10 attempts to bring all of this together. It highlights the different types of competences and resources within an HEI, distinguishing those derived through research, education and its physical

assets (or combinations of them) and the different communities that can become involved in KE (including academics, students and KE professionals). For the knowledge captured within HEIs to deliver socio-economic impacts its needs to be diffused, absorbed and deployed by agents operating in the wider socio-economic system. These mechanisms include the traditional mechanisms of academic publication and graduating students, but also the many interactions that bring non-academic organisations into contact with the HEI, its academic community and its student population. Working with non-academic organisations of different types, this knowledge is absorbed and deployed into practice – with some attempts succeeding and others failing, leading to a variety of benefits experienced by different types of agents within the system.

Figure 10 Framework for understanding role and contribution of knowledge exchange



Source: adapted from Hughes and Ulrichsen (forthcoming)

Critically, the evidence tentatively suggests that the beneficiaries of KE will include not just the agents in the innovation system using the knowledge exchanged through the KE activity (e.g. to enhance their products and services, or increase productivity), but also those academics and students involved in delivering the process (e.g. through enhancing employability and career opportunities). This leads to an important distinction that should be made in reflecting on the scope of KE-S: the extent to which objectives should focus on enhancing the involvement of students in the process of KE to strengthen and broaden impacts on the wider socio-economic system, or focus on using KE-S to deliver specific benefits to students (or a mix of the two).

What also emerges from this discussion is what one means by 'student' in the context of KE-S funding. The term typically conjures up images of full-time campus-based undergraduates. However, this is far from the reality of today's universities with those involved in learning including a much broader set of individuals (including part-time, non-campus-based, lifelong learning, those in-work

etc.). For example, are employees of firms participating in a short course being delivered by academics on the firm's premises students in the context of KE-S?

4 Evaluation methods for KE-S funding: insights from previous evaluations of KE-related funding programmes

Previous evaluations of HEIF offer some insights for the development of a monitoring and evaluation framework for KE-S (Hughes et al., 2011; Ipsos Mori et al., 2018; PACEC, 2015a, 2015b; PACEC/CBR, 2009; Ulrichsen, 2015a). These generally adopted a mixed method approach combining quantitative and qualitative assessments of impacts, and progression towards it, triangulating evidence from multiple sources. Critically, these studies maximised the use of existing monitoring and secondary data on HEIF and KE, and integrating it with additional primary data. Note that while Ulrichsen (2015a) and PACEC (2015a) focused respectively on quantitative and qualitative assessments of the effects of HEIF, they were commissioned by HEFCE to inform the overall evidence base on the impacts of HEIF.

In developing the first major evaluation of HEIF, PACEC/CBR (2009) adopted an innovation systems approach (described in detail in Hughes et al., 2011). They:

- Recognised that it would not be possible to quantitatively estimate the full set of benefits let alone monetise them, so it focused on quantifying outputs where possible, and combining it with an extensive case study and survey programme of academics and non-academic organisations benefiting from HEIF-enabled KE interactions, to better understand the nature of outcomes and impacts, and the extent to which they would have happened anyway
- Sought to triangulate the evidence on the impact of HEIF through multiple sources of evidence – quantitative and qualitative – to address the weakness of not being able to construct strong control groups. This included:
    - Constructing a series of weaker comparison groups designed to test through multiple approaches whether impacts were being realised.
    - Constructing an econometric model to test whether the level of funding received by an HEI, controlling for other factors, had a statistically significant effect on KE performance
    - Developing in-depth case study and survey evidence on the nature and scale of impact of HEIF on non-academic organisations and on changing culture and strengthening engagement processes within the academic community itself
- Explored KE processes in detail through these multiple methods and in particular the difficulties faced by academics and non-academic organisations in engaging in KE

The quantitative assessments of impact developed by PACEC/CBR (2009) and subsequently by Ulrichsen (2014, 2015a) use KE income secured by HEIs as a *proxy* for KE performance and the economic impacts realised through KE. A think-piece by Ulrichsen (Ulrichsen, 2016) on the use of KE income as a proxy for KE performance provides a detailed discussion on this topic. It notes that, while not a direct measure of impact, the income received by HEIs through KE represents the willingness of a non-academic organisation to pay for these services – i.e. an implied demand for the capabilities and expertise available in the HEI. More specifically, assuming that these organisations are behaving rationally (and thus would not invest their scarce resources in completely unproductive areas), if a non-academic organisation is willing to pay a certain amount for a type of KE service (be it

research-related, training-related, or other form of KE), then they must believe that at least this much value will be expected to flow to their organisation from the outputs in the longer term. KE income thus provides an indicator of valued linkages forming between HEIs and non-academic organisations.

The empirical study by Ulrichsen (2015a) further developed quantitative methods for assessing the impacts of HEIF on a more regular basis and were designed to sit alongside more periodic qualitative assessments to provide a robust evidence base. Methods included:

- Exploiting subjective assessments by KE experts in each HEI of the attribution of KE income secured to HEIF funding to develop an estimate of the gross additional impacts resulting from HEIF
- Exploiting data available on KE performance and funding to develop an econometric model to disentangle the effects of HEIF funding from other explanatory factors
- Using the statistical model to compare predicted performance with actual performance in a policy-on vs policy-off state

These methods were developed recognising that it was not possible to implement methods with strong control groups in order to establish attribution and a counterfactual given the nature of the funding programme.

5 Towards a monitoring and evaluation system for KE-S funding

This section attempts to bring together the material presented in this technical report to move towards a practical approach for monitoring and assessing the impacts of KE-S funding (i.e. the DfE contributions to HEIF funding).

Any approach to monitoring and evaluating KE-S impacts should be set within a logic framework as set out in section 2.1. In particular this should clearly set out:

- The *rationale for KE funding* and the need for student-focused KE to address any known market and system failures. For example this could focus on issues such as:
    - capability gaps in the innovation system to absorb and exploit knowledge generated within HEIs, to engage in innovation activities, or even adopt best practice processes and technologies to enhance productivity
    - alignment issues between medium/long term future skills needs and provision in the socio-economic and innovation systems
    - challenges facing student engagement in entrepreneurial activity, such as cultural, capability, resource issues
    - skills and capability gaps hampering the ability of students to realise positive and improved student outcomes such as improved employability and career opportunities, and sustained value of their education over time
- Identify the *target population* for the funding – this will require a clear definition of the types of individuals and organisations expected to be supported by the KE-S funding
- Identify *specific and measurable objectives* moving forward for KE-S funding that are consistent with the overarching objective of HEIF to support KE activities to deliver socio-economic benefits through knowledge exchange.

    - These objectives should be realistic given the amount of KE-S funding being allocated
    - An interesting discussion needs to be had around the balance between objectives that focus on delivering specific benefits to the student population through KE and/or increase the involvement and contribution of students in the KE process to strengthen and broaden KE outcomes realised in the economy and society (but not necessarily by the student). There is obviously a link between the two but the balance may affect how one defines the scope of KE-S funding and the KE-S activities, outputs and outcomes expected.
    - There is also a choice between whether OfS seeks to introduce explicit education, skills and student-focused KE objectives into the HEIF funding process which may reduce the flexibility of the fund – the aspect most valued by HEIs – or whether it maintain the general objective, and create an expectation that some of the outcomes and impacts must be achieved through student-focused KE?
- The nature and scale of *inputs* required to address the objectives, including contributions from DfE and expected contributions from other sources
- The variety of KE-S *activities* likely to be enabled by the resources committed
- The nature of *outputs* expected to be generated through the variety of KE-S activities
- The nature of *intermediate outcomes* expected to be realised if the outputs are generated as planned
- The nature of *impacts* expected to be realised if the outcomes are achieved
- Assumptions and theories about the likely *processes* through which inputs will be converted into activities that will generate outputs leading to intermediate outcomes and impacts

In developing the logic model and monitoring and evaluation framework it is important to recognise the unique challenges facing an evaluation of KE-S funding, not least that we are seeking to disentangle the differential contributions of different resources that make up the common HEIF funding pot prior to distribution to HEIs. HEIs therefore do not know which of the resource they receive is from the DfE contribution and which is from the science budget, nor have they been asked to identify and track investments in student-focused knowledge exchange.

In addition, assessments of the impact of KE-S related HEIF funding will suffer from all of challenges facing the wider evaluation of research and KE funding identified in section 2.1, namely that:

- There is a complex relationship between KE-S inputs, outputs and outcomes/impacts
- There is a wide variety of likely outcomes/impacts, many of which cannot easily be quantified let alone monetised
- There are no easy control groups available as the funding is distributed to most HEIs
- Time lags are likely to be long between investing in KE-S and impacts being realised in the economy and society
- Impacts are likely to require the development of complementary assets and capabilities in order to be realised. Many of these will be outside the control of the public sector and HEIs
- The successful conversion of investments into impacts is highly uncertain given the nature of the innovation process

5.1 Towards an evaluation approach for KE-S funding

The above suggests that evaluations of KE-S funding require:

- A mixed method approach that combines empirical assessments where possible with more qualitative assessments of additional impacts
- An attempt to understand the nature of intermediate and final impacts realised by the target audiences for KE-S, quantifying and monetising them where possible but acknowledging that in many areas this will not be possible
- A particular focus should be on the extent to which KE-S funding is enabling progression along the logic chain to deliver benefits to its *target* audiences (e.g. to students from KE or to innovating organisations through greater involvement of students in KE). For example, this could include establishing:
    - Student as beneficiary
        - how KE-S funded activities are helping students to achieve key student outcomes consistent with the OfS mission (e.g. around improved employability and career opportunities, enhanced and sustained value from their degree over time, and leading more fulfilling lives)
        - understanding the nature of barriers and enablers faced by students, and confounding factors, in realising personal benefits through engagement in KE
    - Student as conduit to effective KE
        - whether KE-S funding is facilitating a range of KE activities that involve students to generate expected outputs in areas consistent with the OfS mission
        - whether these outputs area being successfully translated and diffused into non-academic organisations and exploited by them to generate a variety of intermediate outcomes consistent with the OfS mission (this would include e.g. enhanced skills of graduating students gained through KE making them more productive in the short-term)
        - an understanding the nature of barriers faced by those involved in generating outputs through KE-S, and by non-academic organisations in absorbing and exploiting these outputs
- Methods could include periodic, triangulated surveys of academics, students and beneficiaries, in-depth case studies, and more regular collection of monitoring and other *KE-S specific* data to inform empirical analyses
- Explore the potential for developing quantitative models that capture the effects of KE-S funding, building off existing or revised monitoring and other data. This is considered in more detail in section 5.1.2 given challenges with existing data.

Given the costly nature and burden of full scale evaluations, this should only be done periodically (e.g. every five years) and could be undertaken as part of any wider evaluation of HEIF. This would require an explicit research question to be included that focused on understanding and disentangling the particular contributions of KE-S funding/activities to delivering KE outcomes/impacts. This would shape the design of, and methods used, in the evaluation.

Alongside a periodic full scale evaluation, more regular assessments of monitoring data (quantitative and/or qualitative) could be undertaken to examine progress (e.g. focusing on the scale of investment in KE-S activities by different types of HEIs, novel experiments in initiatives, how KE-S is being integrated with other forms of KE to generate added value opportunities, outputs generated etc.), or address specific research questions of importance at that time (e.g. issues of importance in a Spending Review).

One area for consideration for the development of more regular 'monitoring' data could be the scope of existing national student surveys such as the DLHE to gather insights into students' direct exposure of to, or engagement in, KE. If this data could be linked into other datasets such as the emerging Longitudinal Education Outcomes (LEO) it would potentially unlock new analyses of the effects of KE-S on student outcomes.

5.1.1 Disentangling the DfE and science budget HEIF contributions to impacts

A key part of any evaluation of KE-S funding will be to find ways of disentangle the nature and scale of the DfE contribution to HEIF from the science budget contribution in generating outcomes and impacts.

A key challenge here is that the conditions (currently) attached to the DfE contribution to HEIF – in terms of how an HEI can use the funding and objectives of the funding programme – are exactly the same as those attached to the science budget contribution. In addition no expectation was set on HEIs to spend a certain proportion on KE-S related activities and HEIs do not currently track investments in this way. As such HEIs will currently observe no difference in the differential benefit of deploying funding from the DfE contribution compared with that from the science budget contribution in terms of delivering their basket of KE outcomes. The only differential they will observe will arise from differences in the efficiency and effectiveness of allocating HEIF funding to support different types of KE activity.

One could argue, therefore, that the contribution of DfE funding to KE outcomes is proportionate to the inputs it provides to HEIF (i.e. approximately 22%). The overall ratio of additional KE outcomes to KE funding inputs would be the same for the DfE and science budget contributions (estimated in Ulrichsen (2015a) to be £6.4 for every £1 funding inputted). The focus of any additional analyses here would then be to estimate whether HEIs in aggregate are allocating at an amount approximately equal to the DfE contribution to KE-S relevant activities.

An alternative to this would be to focus on identifying student-focused KE activities and examine the inputs, activities, outputs, outcomes and additional impacts arising from them. Analyses would then focus on whether the investment in these types of activities and returns from them are sufficient to satisfy the funders. It is possible that the amount of funding devoted to this set of activities may be larger *or* smaller than the DfE contribution.

Both of these approaches suffer from a number of difficulties. As discussed in section 3.2, while some types of KE are obviously closely aligned to KE-S (e.g. training/workforce development, student enterprise), there will be a number which are not obviously KE-S related but nevertheless may involve students (for example getting students involved in problem solving projects or consultancies for companies). In addition there may be large KE investments, for example around the development

of strategic partnerships, whose value is dependent on closely integrating research-, teaching- and asset-based KE resources and competences. Existing data does not allow us to establish for each type of KE what proportion of activity is student related. Therefore, estimating what proportion of funding is being allocated to support KE-S activities will be very difficult. It might be possible to collect this data in the future e.g. through HEIF strategies (e.g. adding to Tables A and B in the strategy documents) or revisions to HEBCI data and/or other student-focused surveys.

A third approach for disentangling the nature and scale of the DfE contribution would be to move away from quantitative methods and undertake a programme of qualitative research with KE professionals and HEI decision-makers to try to establish:

- What would happen to KE activities, outputs and outcomes if HEIF was redesigned to focus solely on non-student related KE activities? This would provide insights into whether the loss of HEIF supported KE-S activities have a disproportionately large effect on KE outcomes (noting that KE engagements may well draw on both academics and students, and on research and teaching related competences and assets, and it is this ability to integrate them that may deliver value to users)
- What would happen to KE activities, outputs and outcomes if HEIF was split into two separate funds, one (22% of an HEI's allocation) focused on DfE priorities and the other (78% of the allocation) focused on science budget priorities? This would give insights into the effects of hypothecation, with flexibility removed for each HEI to allocate funding across KE-S and non-KE-S activities based on their specific needs and opportunities.

Taking a step back from this issue, there are some evaluation experts who question whether it is meaningful and indeed at all feasible to disentangle the contribution of different funders to the funding pot which gets allocated to achieve an agreed *common* programme objective. This problem arises in the economic development space with, for example, multiple countries donating funds to an overall budget which gets allocated to achieve particular objectives. The Network of Networks for Impact Evaluation (NONIE)[3] which brings together evaluation experts from a number of large supranational organisations such as the Organisation for Economic Co-operation and Development (OECD) and United Nations to promote quality impact evaluations noted in their guidance document:

> "*tracing impact back from interventions to specific (financial) contributions of different donors, are either meaningless or too complicated to achieve in a pragmatic and cost-effective manner*" (Leeuw and Vaessen, 2009, p. 22)

An implication of this is, should there be *no change* to the objectives of HEIF, whether it would it be sufficient for the OfS to demonstrate that HEIF as a whole is delivering significant value for money, and that across the HE sector adequate investment is being made by HEIs in KE activities that align closely with OfS priorities to justify continued investment in the programme. If this is not sufficient, then disentangling the DfE contribution will likely require either a focus on identifying KE-S specific activities and attempting to evaluate the impacts of these (acknowledging the problems of synergies

[3] NONIE is comprised of the Organisation for Economic Co-operation and Development's Development Assistance Committee (OECD/DAC) Evaluation Network, the United Nations Evaluation Group (UNEG), the Evaluation Cooperation Group (ECG), and the International Organization for Cooperation in Evaluation (IOCE)

with non-KE-S funding) or the setting of clear expectations to recipients of HEIF that part of the funding will need to focus on KE-S and that this will need to be traceable in some way to enable monitoring and evaluation.

5.1.2 Assessing the historical impact of KE-S using existing data

In commissioning this paper OfS requested I examine the possibility of undertaking a *historical* analysis of the impact of KE-S using the data and approach used to periodically assess the impact of HEIF funding as a whole (Ulrichsen, 2014, 2015a, 2018 (confidential briefing)). The approach adopted in these studies focused on multiple quantitative methods to triangulate to an assessment of the impact of HEIF funding on KE performance recognising, as discussed throughout this report, the significant evaluation challenges facing this funding programme. In addition, these analysis were designed to sit alongside wider evaluations that carried out more qualitative and narrative based investigations including in-depth case studies and surveys.

The methods used KE income as the primary proxy for KE outcomes (see discussion in section 4). They sought to estimate the return to investment of HEIF in generating *additional* KE income. This was explored through multiple methods, including:

Analysis 1: Exploiting the expert judgements of KE decision makers on the attribution of KE income of different types to HEIF funding (obtained through the HEIF strategy process)
Analysis 2: Developing statistical models to estimate the marginal effect of HEIF funding on KE income
Analysis 3: Using the statistical model to compare predicted KE income in a scenario where HEIF funding is removed (policy-off case) with the actual KE income (policy-on case)

It would, in theory, be possible to run some of these analyses for sub-categories of KE. In particular Analysis 1 could be re-run based on the different KE support categories requested in the HEIF strategies (Figure 8). HEIs provided expert judgements on the attribution of the basket of KE outputs in each of these categories to HEIF funding.

A challenge here is that, while the attribution can be estimated relatively well for each category, estimating the ratio of gross additional KE outcomes to funding is much more challenging at the sub-category level as this is largely based on the amount of income secured (as income is used as the primary *proxy* for impact). The nature of KE activities in some categories means that they generate much less by way of KE income than others (e.g. social enterprise, knowledge diffusion, or community activities). They nonetheless generate important outcomes and impacts that are hard to quantify and monetise without significant additional effort. Hence while an aggregate assessment of the additional KE outcomes per HEIF funding across all forms of KE is informative, comparisons between categories can be problematic and potentially misleading in terms of the returns to HEIF.

Of the categories in Figure 8, the most feasible for repeating Analysis 1 on different types of KE would be the research exploitation (non-technology transfer), technology transfer, and skills and human capital development.

With regards to Analyses 2 and 3 – developing a statistical model to estimate the effects of HEIF on KE outcomes – it would in theory be possible to develop models that are more specific to KE-S activities. Again as we only have HEIF funding broken down by the categories in Figure 8, one would

be constrained by these categories and the most promising category would be on skills and human capital development. As with the discussion above on repeating Analysis 1 for different types of KE, we could try and develop a model focusing on skills and human capital development (focusing largely on the provision of CPD as this is where the KE data exists).

The central challenge for all of the above is whether the data we have available to us captures the full set of KE-S activities. Absent of this we will inevitably be missing types of KE-S that are important for the overall KE offer being developed by HEIs to meet the knowledge needs of non-academic organisations in the economy and society.

Another important challenge to recognise is that these types of analyses assume a clear dichotomy between different types of KE – i.e. they treat types of KE activities as distinct from each other. The reality is that HEIs are developing a KE services that build on, and often integrate, their strengths in teaching, research as well as the wider resources they have available to them, and that involve academics, students or a mix of both. A focus on the return on investment arising from HEIF for specific KE activity types will miss the important value being derived from being able to integrate these different competences and assets together.

Lastly, this type of analysis would miss any benefits realised by the student from their exposure to, or engagement in, KE. It is hard to see how institution-level data could be used to inform this issue, even if it could be combined with student outcomes data (either at the student or institution-level). My view is that it would be too aggregate to generate enough variation to feed into statistical models that could explore how different factors drive particular student outcomes.

6 Developing data and metrics to assess KE-S funding impacts: discussion and conclusions

How then, do we move forward to develop a practical approach for understanding and capturing the impacts of KE-S funding?

Perhaps the most fundamental issue that needs to be addressed before thinking about how one might develop data and metrics to assess the impacts of KE-S funding is developing clarity on the objectives this type of funding should be expected to achieve and who it should be targeted towards. In this report I raise the distinction between the potential for KE-S activities to lead, directly or indirectly, to improved student outcomes ('student as beneficiary of KE'), and the potential to increase the contribution of students to KE outcomes generated through the delivery of KE engagements of different types with non-academic organisations in the economy and society ('student as conduit to KE outcomes'). In addition, in thinking about the target population, it is important to be clear about who is classed as a 'student' in the context of KE-S funding, consistent with OfS and DfE priorities.

Clarity on the above fundamental issues will help to both frame and guide the development of a clear logic model to capture how KE-S funding is expected to be deployed and generate outputs, outcomes and impacts on the targeted population. This requires a good understanding of: nature and scale of inputs (HEIF/non-HEIF); what activities are being funded; outputs from these activities; and an assessment of the outcomes/impacts likely to be realised from these outputs. While evidence on some of these issues is currently available, there are significant gaps, not least around how students benefit from engagement in, and exposure to, different types of KE. The logic model can

then guide the types of data to collect and metrics to develop that can feed into any evaluation of the impacts of KE-S funding.

In the report, I note that systematic and comprehensive data availability on outcomes and impacts is incredibly limited and challenging to collect. Coupled with the many evaluation-related challenges identified in the report, it may be more productive to focus on whether there is evidence that the outputs are being taken up and used by non-academic organisations, and whether there is evidence that KE activities are leading to the development of skills, capabilities and opportunities for students that are expected to lead to improved student outcomes. In addition to this, in any evaluation one needs to generate insights into the extent to which any observable benefits would have happened in the absence of the funding.

Current data available through HEBCI, HEIF strategies, and other sources were not developed to be able to reveal the nature and scale of KE-S activities and outputs – i.e. those that involve students. This makes it very difficult to use such data – without modification or additional information – to robustly assess the impacts of KE-S HEIF funding. Significant assumptions would have to be made, for example, that KE-S is focused primarily on skills development and student enterprise, for which data is available. This, as discussed, will likely underestimate the set of KE-S activities and hence the breadth and scale of outputs, and outcomes/impacts attributable to KE-S related funding. In addition, it will necessarily overlook the value of KE activities that integrate teaching, research and other resources to provide a holistic KE service to non-academic organisations, and involve both academics and students (e.g. through strategic partnerships or the establishment of major challenge-driven, innovation-focused institutes). In addition there is no *current* dataset which can provide data at the student level which could generate insights into how students themselves benefit through exposure to, or engagement in, KE.

A necessary first exercise would therefore seem to be developing a better understanding of the nature of KE activities that primarily involve students (clearly defined), including understanding any *overlaps and synergies* with other forms of KE, and the expected outputs and outcomes arising from them. This would include an examination of how these types of activities and outputs appear in existing institution-level data sources such as HEBCI, and student-level data sources such as the Graduate Outcomes Survey (previously the DLHE), and where significant gaps exist in either activities, outputs and uptake/outcomes, requiring the collection of additional data. It would also involve a judgement being made on whether existing data sources provide sufficiently robust information on the scale of activities and outputs, and potentially whether these are being taken up and absorbed by non-academic audiences.

Potential datasets include, most obviously, HEBCI and other HESA datasets such as the Graduate Outcomes Survey which includes questions on whether students were setting up their own business, motivations for doing so, how they are funded (including whether they received funding from university business incubators), and helpfully, whether the student is utilising what they learnt at their university in their current role. As discussed in section 3.2 HEBCI data does not provide information on the extent to which KE activities are driven primarily by academics or students. The only obvious categories are 'continuing professional development' and graduate start-ups. However, data on the latter is notoriously unreliable (PACEC, 2015b). In addition, the HEBCI survey only provides data at the institution-level and can say little about how students themselves could benefit.

The Graduate Outcomes Survey that replaced the DLHE still only captures one form of KE-S – graduate start-ups and does not explore wider engagement in other forms of KE. Given the lack of information on the full range of KE-S activities, existing datasets would struggle to provide robust information for assessments of the efficiency and effectiveness of KE-S funding.

The outputs of this exercise could then inform future revisions to the HEBCI survey or other data collection exercises (such as the Graduate Outcomes Survey and the HEIF strategy development process), or help to provide justifications for any additional data to be collected. For example, would it be feasible for HEIs to report on the proportion of (certain types of) KE income that primarily involve students, academics or a combination of both? Would this best be done annually through HEBCI or periodically e.g. through the HEIF strategy development process? How could this enable institution-level analyses of HEIF KE-S related outcomes?

At the student level, the Graduate Outcomes Survey has significantly improved the available information on student start-ups, including on whether the student received any funding from university business incubators (and other sources), and whether they are utilising what they learnt at universities in their work. With information also provided on key graduate outcomes including not just salary but also on subjective well-being, it will be possible to explore in much more depth than previously the value of graduate entrepreneurship as a career pathway, the contribution that university education provides to this, and how access to different types of funding sources (including from university incubators) helps to drive differential graduate outcomes. This has the potential to open up additional quantitative analyses of the role and contribution of KE-related funding to delivering these outcomes.

However, these datasets still only focus on graduate entrepreneurship and do not explore the broader variety of KE activities the students have been exposed to or engaged in. If there is limited appetite to amend existing surveys to capture this type of information, is there appetite for a new survey to be created to collect this information either on a periodic or ad hoc basis or more regularly? If this could be linked to data capturing student outcomes, it could unlock the potential for new student-centric analyses of how exposure to, and engagement in KE by the student affects these outcomes.

A second exercise would then be to understand how KE-S activities are supported through HEIF and other funding programmes, or through other internal/external resources such as course fees. This is important for establishing the scale of HEIF funding being focused on KE-S activities and hence providing evidence to OfS on whether its £47 million contribution to HEIF is investing sufficiently in relevant activities. This could perhaps involve a modification to the HEIF strategy template which requests HEIs report on how they spend their HEIF funding on different categories of KE.

The third, and perhaps the most challenging, exercise would be to examine ways of assessing the attribution of outcomes arising from KE-S activities to KE-S related HEIF funding. This could involve modifying the categories in the HEIF strategy template to request KE professionals estimate the attribution of outcomes in KE-S funded activities (broader than the skills and human capital development category) to HEIF funding, which could then feed into an analysis of the additional outcomes realised as a result of HEIF. Other statistical exercises examining the role of KE-S funding in generating KE-S outcomes would depend on the findings of the first two exercises and any new data

collected. Alternatively these issues could be explored through systematic *qualitative* approaches involving in-depth case studies and surveys of participants.

As set out earlier, a discussion should be had within OfS as to whether a full evaluation of the DfE contribution to HEIF is really necessary (see discussion in section 5.1.1) or whether it would be sufficient to demonstrate the value of HEIF funding as a whole and demonstrate that there is sufficient investment in KE-S related activities to justify the continued investment by the DfE in the fund. In this case the third exercise set out above would be less important. The first two exercises seeking to understand, and improve evidence on, the nature and scale of KE-S related activities, outputs and outcomes, and on the sources of funding underpinning them, would still be necessary to demonstrate that the DfE contribution is being targeted sufficiently well.

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