Effective Practice in Knowledge Exchange

Identifying common and transferable practice in knowledge exchange between universities, business and society

September 2016
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1. **Executive Summary**

1.1. **Introduction**

This report summarises the findings of a small-scale expert study undertaken by Research Consulting on behalf of the Higher Education Funding Council for England (HEFCE). The aim of the study has been to identify examples of good practice in knowledge exchange (KE), in support of a proposed KE framework. Through review of existing KE materials and consultation with key stakeholders, we have sought to identify gaps in the current landscape and to assess the potential value of developing a new repository of KE materials.

1.2. **Scope of work and methodology**

Our work builds on previous studies of KE within English higher education institutions (HEIs) by seeking to identify and catalogue effective practices which support and catalyse knowledge exchange. These practices represent only one factor in the delivery of effective KE and must be viewed in the context of other critical factors such as an engaged, incentivised academic community and an external environment that is conducive to KE.

A total of almost 500 potential sources were reviewed during our work, of which some 250 were classified as either ‘effective practice’ or ‘reference materials’, with the remainder being discarded. Materials were then catalogued and visualised using a network-mapping tool to identify patterns and key relationships.

1.3. **Understanding the landscape**

We have identified more than 50 UK and overseas bodies that provide guidance and support on knowledge exchange, with half of the materials identified being developed by and for the HE sector through the work of membership associations. Government bodies produced just under a third of the most valuable materials, and have an important role to play in acting as ‘honest brokers’, facilitating engagement and dialogue between universities, business, the public/third sectors and other users.

There are well-established ‘communities of practice’ supporting several different aspects of KE, and there is evidence of growing interaction between and across these communities. We also identify cross-cutting themes in relation to the anchor role of institutions, leadership and management, and human capital/skills development, and note that these areas in particular would benefit from further investigation.

1.4. **Sources of effective practice**

The ‘effective practice’ and ‘reference materials’ identified from our work have been categorised as follows:
- **Resource centres** – Existing web-based resources which aggregate material relevant to effective KE practice.
- **Databases and tools** – Online platforms and resources used in particular to support IP commercialisation activities, identification of partners and equipment-sharing.
- **Reports** – Reports commissioned in recent years which provide guidance or observations on the effective delivery of KE.
- **How-to guides** – Guides offering practical guidance on supporting and delivering knowledge exchange ‘on the ground’.
- **Templates and checklists** – The majority of templates and checklists identified from our work take the form of precedents used as the basis for contractual agreements between universities and other parties.
- **Training and professional development** – Providers of training and development in KE.

In each case we have mapped the identified materials against a range of KE activities, highlighting relationships and gaps in the landscape. Please refer to section 5 for further details.

### 1.5. Intellectual property and research contracts

We have given specific consideration to the availability of effective practice materials in the area of intellectual property (IP) and research contracts. In considering this topic, it is critical to distinguish collaborative research from technology transfer, with the former vastly exceeding the latter in terms of both the number of transactions and their financial value. We also note that improved efficiency in contractual negotiations must be balanced with the need for institutions to meet their obligations under charity and (where relevant) company law, in addition to state aid requirements.

Effective practice materials in the area of spin-outs and licensing arise from a relatively limited number of sources – most notably PraxisUnico and the Intellectual Property Office (IPO). We highlight in particular the value of the various ‘practical guides’ prepared by PraxisUnico and the guidance on ‘Intellectual Asset Management in Universities’ prepared under the auspices of the IPO. We note, though, that there are relatively few sources of guidance on fostering and supporting ‘academic entrepreneurship’. There may also be scope to improve links between institutional support structures for technology transfer and the national academies and learned societies to whom academics may also turn for support.

With regard to research contracts, a number of templates and tools have been produced in recent years, but there has been no overarching attempt to develop model agreements that are acceptable to both universities and business since the Lambert review over 10 years ago. Current work being led by the IPO to refresh these agreements is therefore to be welcomed. We also note that ‘problem’ scenarios in the area of research contracts attract disproportionate attention, but typically stem from resourcing constraints or an asymmetry of knowledge between partners, rather than a fundamental disagreement on terms. Relatively little attention has been paid to quality of service and efficiency in the area of research contracts, and institutions have access to few mechanisms by which they can benchmark their performance.

### 1.6. Options analysis for a KE repository

Our work has identified a significant corpus of material which could form the basis for a repository, comprising over 250 resources. Based on the results of our stakeholder consultation, there is some interest in the development of a repository and it could serve a valuable function in preserving and
archiving key materials. We have suggested a range of possible development options, from a simple static resource, to a fully curated repository or knowledge-sharing platform.

However, each of these options has potential disadvantages and the cost/benefit of initiating a substantial project in this area remains unclear. We believe it would be premature to initiate development of a repository at the present time, and further scoping work is needed to assess demand and determine whether and how a KE repository would enhance the existing landscape.

1.7. Conclusions and next steps

This report represents the outcomes of a preliminary study that has identified and mapped existing materials relevant to the delivery of KE. We note that there is a tendency to focus on technical and legal issues as a barrier to KE and that the development of a repository would offer a potential mechanism to collate guidance on these areas. However, recent studies indicate that there is a growing need to prioritise ‘relationships’ over ‘transactions’, and that the importance of legal and technical barriers to KE may be overstated. As a result, we believe the case for creation of a KE repository remains unproven, and further work is needed before such a development is formally initiated. Notwithstanding these reservations, additional investigation could usefully be undertaken in several other areas, as follows:

- Connecting policy, institutional leadership and practice
- Supporting technology transfer and research contracts
- Linking KE practice to institutional size and mission
- Enabling collaboration in the delivery of KE
- Exploring institutional anchor and place-making roles
- Human capital development
- Physical infrastructure – equipment and facilities

Further information on each of these areas can be found in section 8.
2. Introduction

2.1. Background

This report summarises the findings of a small-scale expert study undertaken by Research Consulting on behalf of the Higher Education Funding Council for England (HEFCE). HEFCE was asked to develop a knowledge exchange (KE) performance framework by Government as part of its Science and Innovation Strategy in 'Our plan for growth: Science and innovation', published in December 2014\(^1\). The purpose of the framework is to assist higher education institutions (HEIs) in developing further a culture of continuous improvement in KE activity and becoming more efficient and effective in use of public funding.

As part of its work in developing the KE framework, HEFCE sought to identify examples of good practice through a call for evidence from HEIs. Building on HEFCE’s internal analysis of the results of this consultation process, our role has been to test the work done so far and make recommendations on how it might be taken forward. This includes assessing the potential value of a repository of effective KE practice. We have done this by surveying the wider landscape of KE practice in UK higher education (HE), mapping the networks and stakeholders currently in place, and working with sector representatives to identify next steps.

2.2. Terms of reference

HEFCE’s requirements for this work were as follows:

- To refine further the definition of what are suitable materials for a repository, focussed on common, generic and transferable practices.
- To analyse results of HEFCE’s consultation with the HE sector so as to determine issues and also examine materials returned to the consultation as the basis for the repository.
- To seek out other sources of effective practice. This may include identifying HE and non-HE bodies that operate in related areas of activity/practice and who may produce materials that could be relevant to HE, or easily customised to HE.
- To advise on any gaps identified that might be suitable for development of additional materials relating to effective practices.
- To advise on a structure for a repository of KE materials, and how such material could be categorised in an accessible and meaningful way for HEIs. This includes issues of storage, promotion and refreshing materials, and their costs.
- To take advice from HE sector bodies on use and validation of materials – how to identify that any materials are authoritative, reliable and useful and appropriate for use across the HE sector, and how materials can be presented in an accessible way for HE staff.
- To prepare a final report which describes a potential solution that could be developed in a next stage. This should include commentary on a SWOT analysis of the solution proposed, including short- and long-term costs, conclusions and recommendations on next steps.
2.3. Scope of work

This small-scale study builds on previous reviews of KE in English HEIs, most notably the 2009 CBR/PACEC study "Understanding the Knowledge Exchange Infrastructure in the English Higher Education Sector". As shown in Error! Reference source not found., this study provides a conceptual framework for KE in English HEIs which has informed understanding of the area in recent years. The framework makes clear that knowledge exchange between UK universities, business and other users takes place at many levels, and through a wide variety of mechanisms and processes.

Our work has focussed on the identification of common and transferable practices employed by HEI managers and KE staff in support of effective knowledge exchange. We have considered materials from both UK and overseas sources, and from the HE sector and elsewhere, but our priority has been to ensure that the framework is applicable to the UK context.

Figure 1 Knowledge exchange infrastructure in English HE – a conceptual framework (Source: PACEC/CBR)

- **Leadership and governance**
- **Organisational systems**
- **Strategy**
- **Institutional culture**
- **Incentives and rewards**

### Building internal capability within the HEI

<table>
<thead>
<tr>
<th>Knowledge exchange support functions and infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facilitating the research exploitation process</strong></td>
</tr>
<tr>
<td>Access points for external orgs</td>
</tr>
<tr>
<td>Business development</td>
</tr>
<tr>
<td>Technology transfer</td>
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<tr>
<td>Consultancy support</td>
</tr>
<tr>
<td>Contracts / legal support</td>
</tr>
<tr>
<td>Patenting / IP advice</td>
</tr>
<tr>
<td>Corporate Relations</td>
</tr>
<tr>
<td>Press / communications</td>
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<tr>
<td>Investment funds</td>
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<tr>
<td>Marketing</td>
</tr>
<tr>
<td>External fundraising for research</td>
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<tr>
<td><strong>Skills and human capital development</strong></td>
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<tr>
<td>CPD / short courses</td>
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<tr>
<td>Lifelong learning</td>
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<tr>
<td>Careers services</td>
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<tr>
<td>Work placements / project experience</td>
</tr>
<tr>
<td>Joint curriculum development</td>
</tr>
<tr>
<td><strong>Knowledge sharing / diffusion</strong></td>
</tr>
<tr>
<td>Provision of public space</td>
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<tr>
<td>Alumni networks</td>
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<tr>
<td>KE professional networks</td>
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<tr>
<td>Staff exchanges</td>
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<tr>
<td>Academic – external organization networks</td>
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<td><strong>Exploiting the physical assets of the HEI</strong></td>
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<td>Science parks</td>
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<td>Incubators</td>
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<tr>
<td>Facilities / equipment</td>
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<tr>
<td><strong>Supporting the community / public engagement</strong></td>
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<tr>
<td>Outreach</td>
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<tr>
<td>Volunteering</td>
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<tr>
<td>Widening participation</td>
</tr>
<tr>
<td>Awareness raising / knowledge diffusion</td>
</tr>
<tr>
<td>Involving public in research</td>
</tr>
<tr>
<td>Social cohesion / community regeneration</td>
</tr>
</tbody>
</table>

### Academic activities and mechanisms for knowledge exchange

**Educating people**
- Training skilled undergraduates, graduates & postdoctoral students

**Providing public space**
- Forming/accessing networks, stimulating social interaction
- Influencing the direction of search processes among users and suppliers of technology and fundamental researchers
  - Meetings and conferences
  - Hosting standards-setting forums
  - Entrepreneur/academic planners
  - Alumni networks
  - Personnel exchanges (internships, faculty exchanges, etc.)
  - Working committees
  - Curriculum development committees

**Increasing the stock of "codified" knowledge**
- Publications
- Patents
- Prototypes

**Problem solving**
- Contract research
- Cooperative research with industry
- Technology licensing
- Faculty consulting
- Providing access to specialized instrumentation and equipment
- Incubation services

### Economic and societal benefits
been to identify good practice materials that are of practical value to staff within UK HEIs.

The extent to which successful knowledge exchange occurs is however dependent on many other factors. Of critical importance are what the CBR/PACEC study termed the ‘academic activities and mechanisms for knowledge exchange’, which were not within the scope of this review. However, past studies also point to the importance of the following:

- Availability of a critical mass of new ideas.
- Macroeconomic trends.
- ‘Demand’ side considerations, encompassing business, the public/third sectors and other users.
- Availability of external funding, from both public and private sources.
- Wider government policy at regional, UK and European levels.

The role played by these factors has been considered elsewhere[^3][^4], but falls outside the scope of this report. It is important, then, to recognise that the findings presented here represent effective practices which support and catalyse knowledge exchange. They are a necessary precondition for KE to take place, but will be only truly effective when deployed in conjunction with an engaged, incentivised academic community, and an external environment that is conducive to KE.

### 2.4. Acknowledgements

The support and assistance of the members of the project steering group, representing HEFCE, AURIL, PraxisUnico and UUK, have been invaluable in the preparation of this report (see Appendix A). We are also grateful to representatives of a number of other organisations, including ARMA, UKSPA, UIIN and the UK Innovation Research Centre at the University of Cambridge for their contributions to our work. Particular thanks are due to the Knowledge Exchange team at HEFCE for their guidance and input throughout the project, and to Dr Nick Gostick and Buddug Williams for their comments and suggestions on earlier drafts of this report.
3. Methodology

3.1. Definition of effective KE practice

As the starting point for our work, we adopted HEFCE’s definition of ‘effective KE practice’ as needing to:

a. Deliver both HE benefits, including delivering the goals of the individual institutional mission, and wider societal and economic benefits.
b. Work in the context of legal and regulatory frameworks for HE, such as State Aid and Charity Commission regulations.
c. Be efficient in use of public (and private) funding.
d. And through all the above, be sustainable.

3.2. Categorisations of KE materials

HEFCE proposed the following preliminary categorisation of materials/indicators, based on the results of its sector consultation:

- Technology transfer: spin outs and licensing.
- Research Contracts and Strategic Research Partnerships.
- Small and Medium Enterprises (SMEs).
- Anchor or place-making role of universities.
- Physical infrastructure – equipment and facilities.
- Enterprise/entrepreneurship.
- Skills and employability.
- Leadership, management and broader environment.

These categories are similar to those identified by CBR/PACEC ([Error! Reference source not found.]), but introduce a more nuanced approach in certain areas – for example by distinguishing ‘technology transfer’ from ‘research contracts and strategic research partnerships’, and treating SMEs and the anchor or place-making role of universities as distinct categories. We have used these categorisations in our analysis for reasons of consistency, but have made suggestions on how they could be further refined in section 4.1 and Appendix C.

3.3. Identification of sources of KE practice

Materials and resources relevant to effective KE practice were identified from a wide range of sources, including:

- Results of HEFCE’s 2015 consultation with the HE sector (which identified a total of 131 resources).
- Consultation with the steering group and other key stakeholders.
- Desk-based literature review, covering materials from UK and overseas sources, and from both HE and other sectors.
Our own knowledge and experience.

Given the nature of the topic, and the large volume of materials produced worldwide, our review cannot be described as exhaustive. Nevertheless, we believe it to be broadly representative of the overall body of knowledge on KE practice in UK HEIs.

3.4. Evaluation and classification of materials

A set of generic criteria were prepared for the purposes of assessing materials, covering relevance, practicality, transferability, currency, and credibility (see Appendix B for details). These were used to assess and grade all materials considered in our work as shown in Table 1 below.

Table 1 Evaluation of materials and sources

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
<th>Number of items (as at May 2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective practice</td>
<td>The most relevant and valuable materials/sources</td>
<td>86</td>
</tr>
<tr>
<td>Reference materials</td>
<td>Other materials/sources that may be valuable in some circumstances, but do not constitute effective practice</td>
<td>166</td>
</tr>
<tr>
<td>Discard</td>
<td>Materials that are of only limited value, and do not merit inclusion in a potential repository</td>
<td>240</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>492</td>
</tr>
</tbody>
</table>

A large volume of materials were discarded on the grounds that they arose from single institutions, often in the form of case studies, and had not been independently validated as effective. Furthermore, while there is an extensive body of peer-reviewed literature on knowledge exchange (and particularly technology transfer), in the main these publications were not found to have practical applicability for KE staff or institutional management, and so were also discarded. Those items classified as effective practice and reference materials were then indexed and catalogued, and the organisations responsible for producing or maintaining the materials were also identified and classified.

3.5. Data visualisation and glossary of terms

A list of abbreviations and a glossary of terms is provided in Appendix D. The dataset of items classified as effective practice or reference materials in the course of this study is publicly available (see below). The materials, organisations and KE activities identified through our work were also visualised using Kumu (www.kumu.io), a network/stakeholder mapping tool intended to create and share maps and strategies that are comprehensive, yet comprehensible. Much of the analysis in this report is based on static extracts from our visualisations in Kumu, and for a more complete picture readers are encouraged to visit and interact with the live tool. Links to relevant Kumu visualisations are included throughout this report.

The dataset underlying this report is available as follows:

Johnson, Rob, Fosci, Mattia, Prieto, Nathalia (2016): Effective practice resources in knowledge exchange for UK universities. figshare.  
https://dx.doi.org/10.6084/m9.figshare.3808128

To see the data visualisations in full visit:

www.kumu.io/researchconsulting/effective-practices-in-knowledge-exchange
4. Understanding the landscape

**Headline findings:**

- Our work identified more than 50 UK and overseas bodies that provide guidance and support on knowledge exchange.
- Almost half of the materials we identified have been developed by and for the HE sector, through the work of a range of membership associations.
- Government bodies are responsible for just under a third of the identified materials. They have an important role to play in acting as ‘honest brokers’, facilitating engagement and dialogue between universities, business and other users.
- There are well-established ‘communities of practice’ supporting different aspects of KE, and there is evidence of growing interaction between and across these communities.
- There is a lack of clarity regarding leadership of KE, and how this connects with practice, and further work is required to clarify the role of HEIs as ‘anchor’ institutions, including their role in supporting small and medium-sized enterprises.

4.1. KE mechanisms, sectors and disciplines

Knowledge exchange involves a wide variety of interactions with business, public and the third sectors, and other users, at national, regional and local levels. While there is a tendency to focus on engagement between universities and business, in fact HEIs receive almost 40% more KE investment from partners in the public and third sector than from business§. For the purposes of this section, we have chosen to analyse key stakeholders and communities based on the nature of the KE mechanisms deployed. However, a more nuanced analysis would also need to take account of the sector and disciplinary context involved. For example, effective practice in establishing a collaborative research project with a multinational pharmaceutical company is unlikely to be transferable to one undertaken in conjunction with a local artists’ collective.

4.2. Producers of KE effective practice materials

The 252 resources classified as ‘effective practice’ or ‘reference materials’ were produced by over 50 different organisations. These represent a broad range of public bodies, professional and membership associations, not-for-profits and commercial providers who all play a role in identifying, developing and monitoring effective practice in KE.
As illustrated in Error! Reference source not found., almost half of the materials were produced by independent membership associations\(^1\), such as the National Centre for Universities and Business (NCUB) – an independent body that benefits from HEFCE funding – the University Industry Innovation Network (UIIN), PraxisUnico and the National Centre for Entrepreneurship in Education (NCEE). These associations have arisen partly as a means of sharing good practice between their members, and have a critical role to play in the development and dissemination of effective practice.

Almost a third of the materials identified originate from public bodies, including the Intellectual Property Office, the European Commission, HEFCE and the National Institute for Health Research. These and other government bodies can support the development of practice by bringing together the different stakeholders to reach consensus and develop guidance from a non-partisan perspective.

Finally, just over 20% of the material originate from other sources, including peer-reviewed journal articles, not-for-profits such as NESTA and professional associations like the Association of Research Managers and Administrators (ARMA) and the US Association of University Technology Managers (AUTM).

To explore sources of KE effective practice in full visit:  
www.kumu.io/researchconsulting/effective-practices-in-knowledge-exchange#ke-effective-practices

4.3. Communities of practice and cross-cutting themes

HEFCE’s initial analysis of the consultation results identified eight different ‘baskets of benchmark indicators/practices’. Our mapping of resources against these themes suggests that it might be more appropriate to view them as five distinct ‘communities of practice’ (see Table 2) and three ‘cross-

\(^1\) The term ‘membership association’ is used here to refer to bodies that represent the interests of organisations, and that are typically funded via subscriptions from these organisations. ‘Professional associations’ exist to serve the interests of a particular profession, and their members are thus individuals, rather than organisations.
cutting themes’ (see Table 3). We have shown how these communities and themes correspond to a range of existing taxonomies of KE activities, including the 2009 CBR/PACEC study, in Appendix C.

Communities of KE practice

A community of practice can be defined as ‘a group of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly’⁶. For a community of practice to exist, there must be:

1. A shared domain of interest.
2. A community, whereby members build relationships that enable them to learn from each other.
3. A shared practice, in the form of a repertoire of resources for addressing recurring problems.

As Table 2 indicates, there is not a single community of KE practice, instead there are multiple overlapping communities, each with their own domains of interest and shared practices. That said, the current policy convergence between research and innovation, including the impact agenda, is driving much greater cooperation between and across these communities. This is reflected in a growing tendency for institutional research and enterprise functions to be placed under common management.

### Table 2 Communities of KE practice

<table>
<thead>
<tr>
<th>Community of practice</th>
<th>Comments</th>
<th>Key sources of effective practice</th>
</tr>
</thead>
</table>
| Technology Transfer – Spin-out/licensing | There are a handful of stakeholder organisations which are active solely or predominantly in the area of spin-outs/licensing. These serve the needs of the traditional ‘technology transfer’ community and reflect the distinct set of ‘hard’ skills needed in this area, such as intellectual property law and securing external finance. There is significant overlap between this area of activity and that of strategic contracts and research partnerships, plus important connections to enterprise/entrepreneurship, incubation and leadership/management. | UK – AURIL, Innovate UK, IPO, PraxisUnico  
Europe – ASTP-Proton, European Patent Office (EPO)  
North America – AUTM  
International – World Intellectual Property Office (WIPO) |
| Research contracts and strategic partnerships | Research contracts and strategic partnerships represent another distinct area of practice, with a large number of stakeholders involved in the production of effective practice materials.  
The bodies that are most active in this area often have strong links to the corporate world and tend to be focussed on the mechanisms needed to effectively deliver collaborative research and development. | UK – PraxisUnico, AURIL, ARMA, Centre for Business Research, CBI, Innovate UK, IPO, NCUB, National Institute for Health Research (NIHR)  
Europe – UIIN, Science|Business Innovation Board  
North America – University Industry Demonstration Partnership (UIDP), National Academies |
| Physical infrastructure – equipment and facilities | A distinct community of practice can be identified in the area of science parks and incubation, with the UK Science Park Association (UKSPA) being the pre-eminent body active in this area. It is logical to group equipment and facilities under the same heading, but while there are individual projects and initiatives in these area (see section 5), to date no stakeholder organisation has emerged to take overall ownership | UK – UK Science Park Association (UKSPA), NESTA  
International – International Association of Science Parks (IASP) |
A distinct community exists in relation to student/graduate enterprise/entrepreneurship, with several dedicated bodies active in this area. However, there would appear to be significant overlap between the respective roles of these bodies, and less consensus on what constitutes effective practice when compared with longer-established communities such as spin-out/licensing and research contracts and strategic partnerships.

The practice of academic enterprise tends to be associated with disciplinary communities, rather than a single overarching community of practice. National academies and learned societies are thus key actors in this area, but only a handful (e.g. the Royal Academy of Engineering) have made it a significant focus of their activities.

Social enterprise is also an important strand of activity within this category. Materials and support for social entrepreneurs are provided by UnLtd, which has previously partnered with HEFCE on the SEEnchange project, designed to help mainstream and embed social entrepreneurship support within the HE sector.

Work to develop good practice in engagement with small and medium-sized enterprises (SMEs) remains relatively fragmented, though Business Schools have sought to bring together their work in this area under the Small Business Charter. Engagement with SMEs is not typically identified separately in existing KE taxonomies (Appendix C) and interaction with SMEs can occur within each of the communities of practice already identified. Whether this topic merits detailed review in its own right, or should be subsumed within ‘enterprise’ or the ‘anchor’ role of institutions thus needs further consideration.

### Cross-cutting themes

We consider that three of HEFCE’s preliminary categorisations do not map directly to communities of practice, but instead should be considered as ‘cross-cutting themes’, as shown in Table 3.

#### Table 3 Cross-cutting themes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor and place-making role of universities</td>
<td>Institutions have long played a part in local economic development, particularly through the delivery of European Regional Development Fund (ERDF) projects. Nevertheless, the importance of these themes has grown significantly in importance since the CBR/PACEC study in 2009, particular with the advent of Local Economic Partnerships (LEPs). The anchor role of institutions encompasses a range of economic, social and cultural functions, and thus straddles multiple communities of practice.</td>
</tr>
<tr>
<td>Leadership, management and broader environment</td>
<td>A large number of materials and activities can be considered as relating to this theme. While it could be argued that institutional management constitutes a community of practice, the key membership bodies (such as LFHE and UUK), have taken only a limited interest in KE to date. With the notable exception of the Entrepreneurial University Leaders Programme, relatively few materials have been specifically created by and for institutional leaders.</td>
</tr>
<tr>
<td>Skills and employability ('Human capital')</td>
<td>The skills and employability agenda has links to teaching and student support, but also enterprise, spin-outs, and licensing and strategic research partnerships. Many effective practice materials in this area have been produced by professional and membership associations rooted in the student careers and employability community, while those from the research and enterprise community have focussed particularly on the use of Knowledge Transfer Partnerships. Overall, this remains an under-developed area which would merit further investigation.</td>
</tr>
</tbody>
</table>

We would argue that it is in these ‘cross-cutting’ areas where there is the greatest confusion over what constitute effective practice. There is also scope to clarify the linkages between KE and related activities like public and community engagement (particularly with regard to the anchor role of institutions). Opportunities for further work to be undertaken in these areas are explored further in section 8.
5. Locating effective practice

Headline findings:

- The ‘effective practice’ and ‘reference materials’ identified from our work have been categorised as follows:
- **Resource centres** – Existing web-based resources which aggregate material relevant to effective KE practice.
- **Databases and tools** – Online platforms and resources used in particular to support intellectual property (IP) commercialisation activities and equipment-sharing.
- **Reports** – Reports commissioned in recent years which provide guidance or observations on the effective delivery of KE.
- **How-to guides** – How-to guides represent practical guidance on supporting and delivery knowledge exchange ‘on the ground’.
- **Templates and checklists** – The majority of templates and checklists identified from our work take the form of precedents used as the basis for contractual agreements between universities and other parties.
- **Training and professional development** – Providers of training and development in KE.

5.1. Classifying effective practice sources by format

In the following section, we provide an overview of the different forms of effective practice identified in the course of work.

5.2. Resource centres

Error! Reference source not found. below shows that there are a range of existing resource centres containing material relevant to effective KE practice, from UK, European and North American sources. Within the UK, the most comprehensive general resource centres for KE are considered to be those of:

- NCUB
- AURIL/Jisc, in the form of the Professional Development Resource Finder
- NESTA

Other UK organisations also provide valuable resources relevant to particular aspects of KE, including:

- The Intellectual Property Office, including the Lambert toolkit (for spin-outs, licensing and contracts)
• PraxisUnico (for spin-outs, licensing and contracts)
• NCCPE (for public/community engagement)
• The National Institute for Health Research (for research contracts in health research)

Figure 3 Existing KE resource centres (sized according to number of resources held)

UK universities may also look to North American resources for guidance on effective practice in spin-outs/licensing and research partnerships (AUTM, Tech Transfer Central, Licensing Resource Guide). Within Europe, the UIIN Digital Library provides a comprehensive resource covering most aspects of KE, while the European Commission (EC) projects HEInnovate and the Accelerator Assembly provide resources on enterprise, innovation and incubation. Closer to home, English HEIs may also find it useful to reference the model templates, agreements and guidance materials maintained by Knowledge Transfer Ireland and Interface in Scotland.

To explore the KE resource centres in full visit:
www.kumu.io/researchconsulting/effective-practices-in-knowledge-exchange#ke-effective-practices/ke-resource-centres
5.3. Databases and tools

The use of electronic databases and tools to support effective practice remains relatively limited within the KE community, with the exception of spin-outs and licensing. In this area, the ability to connect inventors, investors and advisors has long been recognised, and a number of databases and tools have been developed both in the UK and internationally to facilitate these interactions. Other notable databases and tools include the ‘equipment.data’ portal, which enables searching across all published UK research equipment databases, and the institutional self-assessment tool developed by the EC’s HEInnovate project.

NCUB’s forthcoming brokerage tool, due to be launched this year, is not reflected in the above diagram, but has the potential to fill an important gap in the landscape by facilitating a step change in the ease with which business-university collaborations can be enabled.

To explore the KE databases and tools in full visit:
5.4. Reports

University KE has been the subject of multiple reports in recent years and it is beyond the scope of this study to assess these individually. However, as shown in Figure 5, the primary focus of these reports has been KE policy, management and the ‘hot topic’ of enterprise and entrepreneurship. A subset of reports have specifically considered the topic of university-business collaboration, but very few have focussed on more technical areas such as spin-out/licensing.

To explore the KE reports in full visit:
https://kumu.io/researchconsulting/effective-practices-in-knowledge-exchange#ke-effective-practices/ke-reports
The single most important source of new studies on KE in recent years has been the NCUB, with multiple reports also produced or commissioned by NESTA, HEFCE, the UK Innovation Research Centre and the European Commission. A range of UK Government-commissioned reviews are also included in this category\textsuperscript{8,9,10}.

Professional and membership associations have frequently been consulted in the production of reports but (with the exception of NCUB, which is itself a membership body), have only rarely commissioned such studies in their own right. This perhaps goes some way to explaining the relative lack of reports on the topic of spin-out/licensing. Given it is these reports that tend to be most influential in shaping public opinion and policy on KE, the limited contribution made to the debate by KE practitioners is a potential cause for concern.

5.5. How-to guides

How-to guides represent practical guidance on supporting and delivery knowledge exchange ‘on the ground’. The picture here is almost the inverse of that for reports, with how-to guides most prevalent in the area of spin-out/licensing and, to a lesser extent, research contracts and strategic partnerships. This reflects the importance of sound technical knowledge and practice in these areas. Around 50% of the how-to guides identified in our work were produced by professional bodies and membership associations. This indicates the crucial role played by these organisations in developing and disseminating effective practice to KE practitioners.
5.6. Templates and checklists

The majority of templates and checklists identified from our work take the form of precedents used as the basis for contractual agreements between universities and other parties. In addition to the model agreements prepared by the Lambert review and hosted by the IPO, other examples originate from the NIHR, Innovate UK, the Brunswick group, the DESCA core group (for European projects) and the Easy Access IP initiative. The role of these templates in streamlining contractual negotiations is considered further in section 6.4.

To explore the templates and checklists in full visit:
5.7. Training and professional development


The availability of training and support for professional development is critical in the development of effective KE practice. Key examples identified from our work, as shown in Figure 8, include:

- The Jisc/AURIL Business and Community Engagement (BCE) framework, launched in 2012, which describes the purpose, aims and drivers of BCE, maps the landscape and identifies 16 BCE ‘processes’.
- The HEInnovate training materials, which are designed to support institutions in assessing their entrepreneurial and innovative potential across seven dimensions.
- PraxisUnico training and events, a key source of practical support and guidance for practitioners in the areas of spin-outs/licensing and research contracts.
- The Entrepreneurial University Leaders Programme, led by vice chancellors, experts, visionaries, practitioners and policy makers in the field of university education.
- Training programmes in enterprise/entrepreneurship from IEEP, NACUE, and from ASET and NASES for skills and employability.
6. Identifying effective practice – IP and contracts

Headline findings:

- In considering contractual issues centred on the ownership of IP, it is important to distinguish collaborative research from technology transfer, with the former vastly exceeding the latter in terms of both the number of transactions and their financial value.

- Improving the efficiency of contractual negotiations is a desirable goal, but must be balanced with the need for institutions to meet their obligations under charity and (where relevant) company law, in addition to state aid requirements.

- Effective practice materials in the area of spin-outs and licensing arise from a relatively limited number of sources – most notably PraxisUnico and the Intellectual Property Office.

- A number of templates and tools to support collaborative research have been produced by funding bodies in recent years, but there has been no overarching attempt to develop model agreements that are acceptable to both universities and business since the Lambert review over 10 years ago.

- ‘Problem’ scenarios in the area of research contracts attract disproportionate attention, but typically stem from resourcing constraints or an asymmetry of knowledge between partners, rather than a fundamental disagreement on terms.

- Relatively little attention has been paid to quality of service and efficiency in the area of research contracts, and institutions have access to few mechanisms by which they can benchmark their performance.

6.1. Identifying effective practice materials

As the previous section illustrates, there are a multitude of sources to which HEIs and KE practitioners can refer on the subject of knowledge exchange. However, only a minority of these meet the definition of effective practice materials. At HEFCE’s request, we have given particular attention to national policy areas where issues of common and effective practice have been raised, notably around handling intellectual property (IP) in research agreements.

Within this section we have therefore sought to highlight specific examples of effective practice in the areas of spin-outs/licensing and research contracts and strategic partnerships. It should be noted that these are complex areas, and so the analysis which follows is intended only to provide a broad overview of the key issues and materials identified from our work.
6.2. Research contracts, intellectual property and technology transfer

In considering the barriers to knowledge exchange between universities and business, there is a tendency to reference contractual issues centred on the ownership of IP. While both collaborative research and technology transfer typically involve negotiation over IP rights, the difference in the nature and scale of these activities is significant. Total income to UK HEIs from spin-outs and licensing was £131m in 2013/14 – barely 5% of the amount received from collaborative and contract research, £2,336m5. Furthermore, the skills required to deliver these two activities are not identical, and they are often handled by different support functions within the institution. In consequence we have considered them separately in the sections that follow, and throughout this report.

It is also important to stress that effective practice in both these areas is not synonymous with speed. Universities are obliged to comply with charity and state aid legislation, and so effective practice materials must serve equally to protect universities and enable them to fulfil their statutory obligations as well as to streamline the negotiating process.

6.3. Effective practice in spin-outs and licensing

As illustrated in section 5.5, the majority of ‘How-to guides’ identified in our work are centred on the area of spin-outs and licensing. Efforts to codify and disseminate effective practice in this area have generally been led from two key sources – PraxisUnico and the Intellectual Property Office. PraxisUnico publishes ‘practical guides’ that address licence agreements, options and spin-out companies, and it also provides a wide range of training courses focussed on the needs of KE practitioners. Meanwhile, the IPO is the primary source of template agreements relevant to spin-outs and licensing, and is responsible for several key studies and guidance documents. Some of these materials are generic (e.g. the IP Finance Toolkit, IPR valuation checklist, template NDAs and skeleton licence agreements), but others have been tailored to the needs of the HE sector and are hosted in a dedicated collection (‘IP for universities: guidance, tools and case studies’). Over the period 2011-14 the IPO also provided funding designed to encourage collaboration between universities, businesses and local communities through its Fast Forward competition.

The materials noted above provide sound reference points in relation to the process of technology transfer, from a technical and legal perspective. We found very few materials that provide comprehensive guidance on other aspects of technology transfer, however, such as approaches to market assessment and opportunity evaluation. This is likely to reflect the level of professional judgement and sector/market-specific knowledge required to undertake these tasks effectively, but may nevertheless be an area for further investigation. The relationship between spin-outs, licensing and academic enterprise is also somewhat under-explored.

Table 4 provides key examples of effective practice in spin-outs and licensing, developed by and for the UK HE sector. Resources do therefore exist to support institutions in developing sound processes to support the formation of spin-outs and licensing. More could be done to understand how institutions might best support academics in engaging with these processes, and to connect institutional support structures to disciplinary communities and the work of learned societies and national academies.
Table 4 Effective practice in technology transfer: spin-outs and licensing

<table>
<thead>
<tr>
<th>Name</th>
<th>Classification</th>
<th>Source</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual asset management for universities</td>
<td>How-to guides</td>
<td>The guide was produced by a committee chaired by the Intellectual Property Office, with representatives from PraxisUnico, HEFCE, UUK, AURIL, BBSRC and BIS.</td>
<td>One of very few documents that successfully marry policy and practice, the guide provides a comprehensive overview of IP issues in universities for senior university managers, as well as practical guidance on the development of institutional IP strategies and policies.</td>
</tr>
<tr>
<td>Practical guides – licensing, options, spin-out companies and confidentiality agreements</td>
<td>How-to guides</td>
<td>PraxisUnico</td>
<td>Written by and for practitioners, the practical guides are essential reading for university staff engaged in IP commercialisation. However, with the exception of older materials, they are only accessible to PraxisUnico members.</td>
</tr>
<tr>
<td>Researcher’s guides – spin-out companies, intellectual property and confidentiality, licensing</td>
<td>How-to guides</td>
<td>Mr Clive Rowland, CEO, The University of Manchester Intellectual Property Limited (UMIP) and Ms Janet Knowles, Partner, Eversheds LLP.</td>
<td>These guides are intended to act as a researcher’s reference to help with key issues relating to IP and its commercialisation. Though developed by UMIP, they are available to be shared and used more widely for the benefit of those working to commercialise academic research.</td>
</tr>
</tbody>
</table>

6.4. Effective practice in research contracts and strategic research partnerships

Our analysis suggests that the time and effort devoted to diagnosing the problems with research contracts and strategic partnerships (reflected in the number of reports and reviews of this area) outweighs that put into identifying practical solutions, in the form of model agreements and guidance for contracts practitioners. We have identified a number of examples of effective practice in this area in Table 5, which appears later in this section. However, with the exception of the Lambert review (now more than ten years old), there has been no overarching attempt to develop model agreements that are acceptable to both universities and business.
However, individual funding bodies have invested significant time and effort in developing standard agreements to be used by project participants – prime examples being the NIHR, Innovate UK and the European Commission (via the DESCA initiative). A significant proportion of collaborative research projects involving universities and industry are therefore undertaken on standard terms that are largely imposed by the relevant funders. Project participants are usually familiar with the format of these agreements, and accept them as a condition of funding, meaning fundamental disagreements are rare.

The perception that contracts are barrier to collaborative research is by no means representative of the typical position across the HE sector. Despite this, we would suggest the concern persists as an issue due to three root causes:

1. Inefficiencies and delays in the processing of agreements, often due to resource constraints within one or more of the parties’ contracts functions
2. Non-academic partners who are unfamiliar with the contractual arrangements required when working with universities – particularly small and medium-sized enterprises.
3. Contracts between universities and non-academic partners where there is no public funding, meaning a negotiation from ‘first principles’ is required, or the funder does not provide/require a suitable template (e.g. the seven UK Research Councils).

These ‘problem’ scenarios attract disproportionate attention compared with the significant volume of activity that takes place relatively smoothly. However, responsibility for addressing them has generally been left to the HE sector itself, with support from the IPO. Given that universities represent only one party to any negotiation, the scope to deliver significant improvements through this approach is inevitably limited.

There is evidence that this is changing, particularly through the efforts of NCUB and collaborative initiatives such as the 2015 Guide to Business-University Collaboration ‘Best of Both Worlds’ from the CBI and Middlesex University. There is also increasing recognition of the importance of long-term relationships in developing fruitful partnerships. Nevertheless, there have been no serious attempts to establish new, overarching model agreements for collaborative research between universities and business since the Lambert review in 2004. Work currently being led by the IPO to revise and update the agreements is therefore to be welcomed.

A further gap in the current evidence base is data on quality of service and the efficiency with which contracts are handled across the sector. While concerns over ownership of IP typically receive the greatest attention, the importance of speed and professionalism in university contracts functions is frequently overlooked. However, with the exception of a 2013 review conducted by Research Consulting for the Brunswick group, relatively little attention has been paid to this area, and institutions have very few mechanisms by which they can benchmark their performance. This gap was acknowledged by the Dowling review, which proposed that: ‘Universities that are confident of the performance of their technology transfer office (TTO) in supporting the establishment of collaborations should publicise statistics that highlight their efficiency and effectiveness’.
### Table 5 Effective practice in research contracts and strategic partnerships

<table>
<thead>
<tr>
<th>Material/resource</th>
<th>Classification</th>
<th>Source</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical guide to general legal issues in university contracts</td>
<td>How-to guides</td>
<td>PraxisUnico</td>
<td>As with PraxisUnico’s guides on spin-outs and licensing, these are key resources for practitioners, but only accessible to PraxisUnico members.</td>
</tr>
</tbody>
</table>
| Lambert toolkit   | Resource centres     | Lambert Working Group on Intellectual Property | The Lambert agreements represented a concerted effort to develop a common approach to contracting for collaborative research between universities and business. The toolkit consists of:  
- a set of 5 model research collaboration (one-to-one) agreements  
- 4 consortium (multi-party) agreements  
- a decision guide  
- guidance documents  
Usage of the agreements in unchanged form is relatively limited, and elements have become out-of-date over time. Nevertheless, a 2013 review by IP Pragmatics found that the toolkit was ‘valued as a good solid foundation for negotiation, a source of clauses that can help resolve negotiation points, and an independent exemplar of a fair and reasonable approach’. The review concluded ‘the Lambert toolkit had a positive influence on some innovative research partnerships between UK universities and businesses’.

<table>
<thead>
<tr>
<th>NIHR industry tools</th>
<th>Resource centres</th>
<th>NIHR</th>
<th>The set of model agreements developed by NIHR are the result of concerted effort by public and private stakeholders in health research to speed up the contracting process. 8 different model agreements have been prepared, and are accompanied by guidance notes on their application.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCA 2020 model agreement</td>
<td>Templates and checklists</td>
<td>DESCA core group</td>
<td>DESCA (Development of a Simplified Consortium Agreement) is a comprehensive Model Consortium Agreement which offers a reliable frame of reference for project consortia on EC-funded projects. The signature of a Consortium Agreement between the partners of a research project is mandatory for almost every EC Horizon 2020 project. DESCA was launched and is managed by a Core Group, which also provides the experts who produced DESCA and maintain it.</td>
</tr>
<tr>
<td>Innovate UK collaboration agreement</td>
<td>Templates and checklists</td>
<td>Innovate UK</td>
<td>All collaborative competitions run by Innovate UK require a collaboration agreement to be signed by all partners before their project starts. This is a requirement defined in the Conditional Offer Letter. An example collaboration agreement is available on the competition website once participants have registered for the competition. The Collaboration Agreement should be the only agreement in addition to the Offer Letter between the project participants. It should incorporate provision for project management, as</td>
</tr>
</tbody>
</table>
well as the operation and exploitation of the outcomes of the project.

<table>
<thead>
<tr>
<th>Managing research contracts</th>
<th>Reports</th>
<th>Research Consulting, on behalf of the Brunswick Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>This 2013 review was commissioned by the Brunswick group, representing 20 research-intensive institutions, in response to growing concerns at the pressure placed on institutional contracts functions. It gathered benchmarking data on contract volumes, processing costs and staffing levels across the participating institutions, allowing institutions to make an informed assessment of their resourcing and service levels in this area.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Building long term strategic university-industry partnerships: lessons and effective practices from UK and US experiences</th>
<th>Reports</th>
<th>Tomas Coates Ulrichsen and Eoin O’Sullivan</th>
</tr>
</thead>
<tbody>
<tr>
<td>This report sets out key lessons, insights and effective practices for developing and nurturing university-industry strategic partnerships (UISPs). It presents the findings from a workshop held in Cambridge in March 2014 to identify what needs to be done to strengthen the ability of universities and industry to develop mutually beneficial and effective strategic partnerships.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Best practice strategies for successful innovation through university-business collaboration</th>
<th>Reports</th>
<th>Innovate UK/RCUK/NCUB</th>
</tr>
</thead>
<tbody>
<tr>
<td>This study highlights the benefits for businesses of collaborating with universities to draw on research knowledge, skills and expertise and to increase their capacity for innovation. It outlines the challenges involved in the process of adapting academic knowledge and expertise for business use and it offers tried and tested tools for addressing these challenges. The report describes a model of the ideal attributes and outcomes of effective knowledge transfer processes, drawing on a wide range of knowledge domains and operational research practice.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In the course of this review we have identified a large body of materials, developed mechanisms for their classification and validation, and formally catalogued over 250 resources which could form the basis of a KE repository. Our stakeholder consultation indicates that there is some interest in developing an authoritative source of knowledge and good practice in KE, which could serve as a means of formally preserving valuable resources.

We are also able to propose a range of possible options for the development of such a repository, as laid out in Table 6 below.

### Table 6 Options for development of a KE repository (in ascending order of cost)

<table>
<thead>
<tr>
<th>Option</th>
<th>Comments</th>
<th>Estimated cost per annum (£000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static spreadsheet/visualisations</td>
<td>The outcomes of this work are available online in the form of a dataset and visualisations using the Kumu tool. These provide a static record of current KE resources, and are made available alongside this report at no additional cost. However, without an active attempt to promote and refresh the content it is unlikely to be widely used.</td>
<td>Nil</td>
</tr>
<tr>
<td>Curated spreadsheet/visualisations</td>
<td>The existing Google sheet and Kumu visualisations could be updated over time as new resources emerge. This would require the identification of an individual or organisation able to take on this role, but could be completed at a relatively low cost. Again, the limitation of this approach is that it is unlikely to find a wide audience, and may not be adequately rooted in the communities of practice identified from our work.</td>
<td>£10-15k</td>
</tr>
<tr>
<td>Extension/amalgamation of existing resources</td>
<td>One or more of the existing resource centres identified in section 5.2 could be extended or combined to include a greater range of material. This would benefit from being directly connected to one of the KE membership associations or communities of practice. A possible</td>
<td>Variable, and would require further</td>
</tr>
</tbody>
</table>

### Headline findings:

- Our work has identified a significant corpus of material which could form the basis for a repository, comprising over 250 resources.
- There is some interest from stakeholders in the development of a repository, and it could serve a valuable purpose by preserving and archiving key materials.
- A range of possible development routes can be identified, but each has significant disadvantages, and the cost/benefit of initiating a substantial project in this area remains unclear.
- We believe it would be premature to initiate development of a repository at the present time, and further scoping work is needed to assess demand and determine whether and how a new repository would enhance the existing landscape.
<table>
<thead>
<tr>
<th>Centre</th>
<th>Candidate could be the Jisc/AURIL BCE resource finder, which had a similarly broad scope, but is no longer actively maintained. Other key resource centres from NCUB, PraxisUnico and the IPO serve only one or two communities of practice, and so would not be appropriate as a central location covering all aspects of KE. It is likely that this option would therefore only be viable for a subset of materials, e.g. those relating to contracts and IP/technology transfer.</th>
<th>Scoping and discussion with operators of existing resource centres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curated repository</td>
<td>A public-facing repository would provide a long-term home for the documents that would encourage re-use. The majority of HEIs use repository platforms to list or share their research outputs (publications or data). A repository would provide a public ‘landing page’ for each document, that is searchable via keyword. Repositories also capture metadata to describe the contents of the document or web resource. Common repository platforms include DSpace and Eprints, an example from the University of Cambridge illustrates how a record could look: <a href="https://www.repository.cam.ac.uk/handle/1810/236349">https://www.repository.cam.ac.uk/handle/1810/236349</a> Identification and curation of new documents would need to be managed by a part-time member of staff to ensure the quality of the documents being shared. Repositories are usually hosted in-house or via ‘Software as a Service’ providers such as DSpaceDirect or Eprints Services. The key disadvantage of this option how the contents would be promoted to and accessed by the KE community. In addition, a suitable organisation would need to be identified to ‘own’ the repository. As with the first two options above, without active promotion the content is unlikely to find a wide audience.</td>
<td>£15-50k</td>
</tr>
<tr>
<td>Knowledge sharing platform</td>
<td>A more substantial project could be initiated to develop a KE web resource modelled on the Efficiency Exchange (<a href="http://www.efficiencyexchange.ac.uk">www.efficiencyexchange.ac.uk</a>). This is a platform provided by Universities UK and Jisc for discovering and sharing knowledge relating to efficiency and effectiveness in HE. Designed to work in conjunction with existing networks and resource centres, its function is not to store large quantities of material, but rather to translate and promote uptake of existing content, through innovative use of social media and other activities. Such a site could also function as a showcase for the wide range of existing KE initiatives and activities taking place within the sector. This option has the greatest potential to disseminate effective practice more widely, but would also require the greatest investment.</td>
<td>£100-200k</td>
</tr>
</tbody>
</table>

As the above analysis shows, each of these options has significant challenges, and the value of such a repository to the sector remains largely unproven. We therefore believe it would be premature to initiate the development of a repository until a number of other questions highlighted through our work can be resolved. These include:

- Alignment of the proposed repository with the large number of existing resource centres identified in section 5.2.
- Scope of the repository, including whether it would cover all aspects of KE, or only a subset, such as contracts, IP and technology transfer.
- The role to be played by membership associations in supporting or promoting the repository.
• Evidence of demand and the anticipated user base for the repository, including gathering data on KE practitioners’ current approaches to finding and engaging with effective practice materials.
• Identification of the mechanisms to be used in promoting repository content to the user community.
8. Conclusions and next steps

Headline findings:

- This preliminary study has identified a wealth of existing materials relevant to the delivery of KE and highlighted the crucial role of membership associations in this area.
- While there is a tendency to focus on technical and legal issues as a barrier to KE, recent studies indicate that there is a need to prioritise ‘relationships’ over ‘transactions’.
- The case for a KE repository remains unproven, and further work is needed before such a development is formally initiated.
- Further work could usefully be undertaken in several areas including:
  - Connecting policy, institutional leadership and practice
  - Supporting technology transfer and research contracts
  - Linking KE practice to institutional size and mission
  - Enabling collaboration in the delivery of KE
  - Exploring institutional anchor and place-making roles (and links to public engagement)
  - Human capital development
  - Physical infrastructure – equipment and facilities

This report reflects the outcomes of a small-scale, preliminary study of effective practice materials for KE. Its purpose has been to survey the landscape of existing materials and highlight gaps and opportunities for further development of materials. Our review has identified a wealth of existing materials relevant to the delivery of KE, and highlighted the crucial role played by membership associations, in particular, in creating and disseminating these resources. These resources take a wide range of forms, from how-to guides and reports to online databases and professional development programmes. Nevertheless, the limited scope of this review means it is inevitable that some existing sources have been missed and that other effective practices exist which have yet to be captured and codified.

In general, there is only limited evidence that more technical guidance, tools and templates are needed to improve the effectiveness of KE. The tendency to focus on such materials may reflect a perception that legal issues regarding IP are a key barrier to KE, and that most KE interactions take place between universities and business. As noted in section 4.1, HEIs in fact have substantially more interactions with partners in the public and third sectors than business, while recent evidence calls into question the significance of the perceived legal barriers. Instead, the recurrent theme across a
range of recent reports, reviews and peer-reviewed papers on the topic of KE\textsuperscript{8,12-14} is the importance of pursuing long-term relationships over short-term transactions and income. The soft skills needed to effectively cultivate these relationships are harder to identify and codify than transactional mechanisms, and thus less suited to being captured in a KE repository, but we would suggest this is where efforts to improve KE practice should be focussed.

There is also a risk of overstating the importance of the mechanisms by which KE is supported, rather than focussing on the culture, incentives and external environment that allow it to flourish. Given the large number of communities and stakeholder associations that are already involved in the delivery of KE, we remain unconvinced that the creation of an overarching KE repository would add significant value. As outlined in section 7, further work would be needed to determine the scope and purpose of such a resource, and to situate it appropriately within the existing landscape.

In addition to the need for further investigation into a repository, we have identified several other areas where additional work could fruitfully be undertaken. These are summarised in the remaining sections of this report.

8.1. Connecting policy, institutional leadership and practice

We have noted the critical role played by membership associations and professional bodies in the production and dissemination of effective practice in KE. These bodies have primarily emerged from within the sector and serve the needs of the various communities of practice identified in our work. The existing mechanisms for sharing effective practice can thus be seen as primarily bottom-up in nature – though frequently aided by the efforts of government bodies including HEFCE, the IPO and the NIHR.

By contrast, our work found only limited guidance on KE developed by and for institutional leaders and managers. We note the work of the NCEE through the Entrepreneurial University Leaders Programme (EULP) and the existence of resources such as the guide on ‘Intellectual asset management for universities’\textsuperscript{15}, produced by a consortium of stakeholders under the auspices of the IPO. Nevertheless, these are the exception rather than the rule, and we attribute this to a couple of key factors:

- The technical complexity associated with some KE activities, particularly in the fields of technology transfer and research contracts.
- A mismatch in the way KE is perceived by UK institutional managers, researchers and KE practitioners, as observed in recent studies of this area\textsuperscript{16,17}.

In view of these issues, we believe more can be done to engage institutional leaders and managers in the delivery of effective KE. The involvement of UUK representatives on the steering group for this project and the active engagement of individuals at Vice-Chancellor and Pro-Vice-Chancellor level in the current McMillan review of technology transfer represent positive steps in this direction.

8.2. Supporting technology transfer and research contracts

As requested by HEFCE, we have considered the resources available to support technology transfer and research contracts/strategic partnerships in greater detail. These two activities are frequently conflated, but there are important differences between the two in terms of scale and in the communities and institutional structures involved. In both cases there are a number of established, credible templates, how-to guides and reports that universities can refer to. Nevertheless, there is
scope to refresh or update some of these materials, particularly agreements for collaborative research, and we welcome the work currently underway to update the Lambert toolkit. Technology transfer needs to be connected effectively to academic enterprise, and so efforts should be made to develop linkages between institutional support structures, national academies and learned societies. There may also be an opportunity to undertake further work aimed at improving service quality and efficiency in the management of research contracts – recognising that this must not occur at the expense of effective risk management and legislative compliance.

8.3. Linking KE practice to institutional size and mission

This review has considered effective practice in KE in largely generic terms, but in practice the drivers and mechanisms for undertaking KE vary significantly between institutions. Past studies in this area have tended to conclude that there is no single best practice approach to questions such as how institutions manage their IP, or how they structure their knowledge exchange support functions. The extent to which effective KE practice can be codified and promoted across the HE sector as a whole may thus be limited, but there have been only a few attempts to consider these questions at a more granular level (one example being 'Innovation systems and the role of small and specialist institutions’ by GuildHE/CREST).

By way of example, there may be scope to investigate further how less research-intensive institutions can best support specialist activities such as technology transfer, given the necessary expertise may not be available in-house. This could identify the potential for such institutions to make greater use of collaborative platforms such as the Innovation Commons (www.theinnovationcommons.co.uk) to share expertise and networks.

8.4. Enabling collaboration in the delivery of KE

We identified very little established good practice guidance on the establishment and management of institutional collaborations in KE. This is somewhat surprising, given that a 2012 review of institutional Higher Education Innovation Funding (HEIF) strategies indicated that 75% were exploring shared services and collaborations in this area. There are a number of existing examples of collaborative practice in the delivery of KE, including the SETsquared partnership, and we are aware of some institutions outsourcing their IP exploitation functions to larger institutions or the private sector. However, to date there has been no concerted effort to formally evaluate the benefits derived from these collaborations, or to share models and learning points that could be adopted more broadly within the sector.

8.5. Exploring institutional anchor and place-making roles

Recent years have seen a growing focus on universities as drivers of economic, cultural and social development, particularly within their local area. This can be traced to a number of factors, including the impact agenda, smart specialisation, HEIs’ key role in the delivery of ERDF projects, and the creation of LEPs. Both the Wilson (2012) and Witty (2013) reviews highlighted the role of universities as ‘anchor’ institutions, drawing on a 2010 research paper by the Work Foundation. Our work also identified a large number of case studies of the role of universities in local development, particularly from North American and European sources.
Despite this, the resources gathered under this cross-cutting theme do not provide a coherent picture of the mechanisms by which institutions can fulfil this anchor role. The links between the disparate social, cultural and economic activities collected under this heading also remain unclear, as does the relationship to public and community engagement. Further work could allow a more robust conceptual framework for the role of English HEIs as anchor-institutions to emerge, and demonstrate how effective KE supports this.

8.6. Human capital development

The role of universities in supporting human capital development extends well beyond the remit of this review. We have identified a subset of KE materials with links to skills and employability, such as guidance on the management of Knowledge Transfer Partnerships (KTPs) and on employer placements, and we found an extensive body of literature on student enterprise and entrepreneurship. However, there is undoubtedly much more which could be done. For example, we found few examples of effective practice in developing and supporting ‘academic entrepreneurs’, while the relationship between knowledge exchange and teaching fell outside our scope of work, but may merit more in-depth consideration.

8.7. Physical infrastructure

Existing effective practice materials on the topic of physical infrastructure – equipment and facilities – appear limited. Only a handful of membership bodies are active in this area, most notably the UK Science Park Association, and while several equipment-sharing initiatives do exist, these have yet to cohere into a distinct community of practice. However, our work was primarily focussed on materials in the public domain, so it is possible that other valuable resources exist which are only available to members of the relevant bodies. A more focussed study of this area could therefore yield additional materials, for example with regard to good incubation practices.
Appendix A  Project steering group

Thanks are due to the following individuals who served as part of the project steering group:

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alice Frost</td>
<td>HEFCE</td>
</tr>
<tr>
<td>Sarah Fulton</td>
<td>University of Sheffield / PraxisUnico</td>
</tr>
<tr>
<td>Martin Davies</td>
<td>University of Greenwich / AURIL</td>
</tr>
<tr>
<td>Greg Wade</td>
<td>Universities UK</td>
</tr>
<tr>
<td>Martina Tortis</td>
<td>Universities UK</td>
</tr>
</tbody>
</table>
Appendix B Quality criteria for effective practice materials and resources

The KE resources identified for consideration in our work included documents, repositories of documents and initiatives from a variety of academic and non-academic sources. Our approach was to progressively refine the identified material into a smaller set of high-quality materials for potential inclusion in a repository. In order to achieve that, we undertook the following activities:

- Initial review of KE material, using minimum acceptability criteria to exclude the least useful or relevant items from the database (i.e. material that cannot be considered ‘good practice’).
- Stakeholder consultation to establish more rigorous and detailed quality criteria for the final selection of material for inclusion in HEFCE’s database.
- Text-mining software to test the initial categorisation of material through key word analysis.
- Final selection of KE best practice material and categorisation as ‘effective practice’ or ‘reference materials’.

The following criteria were used in our review of KE material:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
<th>Scale</th>
<th>The resource was excluded if (e.g.)...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>We assessed the relevance of KE material to UK universities, based on the subject matter and the approach taken.</td>
<td>1-3</td>
<td>It is mostly concerned with non-KE activities, or it arises from a country or sector which has little in common with UK HE</td>
</tr>
<tr>
<td>Practicality</td>
<td>We considered whether the resource had direct applicability for KE practitioners or institutional management, for instance by assisting operations, providing legal guidance, or disseminating practical information.</td>
<td>1-3</td>
<td>It is a high-level academic (or non-academic) analysis of KE issues without direct applicability in an institutional context</td>
</tr>
<tr>
<td>Transferability</td>
<td>We assessed whether the content of the resource was easily transferable to other institutional contexts. This criterion was double-weighted given its importance.</td>
<td>1-3, double-weighted</td>
<td>It comprises a case study from a single HEI (such as marketing material about the KE performance of an institution)</td>
</tr>
<tr>
<td>Currency</td>
<td>We considered resources dating as far back as 1996 but preference was given to the most recent resources. Those produced within the last 3 years were given the highest score, followed by those 3-5 years old, then 5-10. Materials over 10 years were given a score of 0.</td>
<td>0-3</td>
<td>It contains reference to outdated regulations or has been superseded by a more recent resource</td>
</tr>
</tbody>
</table>
Credibility

We assessed the credibility of the author/source of the resource.

1-3

It is poorly written or presented, or it comes from unknown sources

After calculating a total score for each item reviewed, materials were categorised as follows:

<table>
<thead>
<tr>
<th>Score</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-11</td>
<td>Discarded materials (materials that are of only limited value, and do not merit inclusion)</td>
</tr>
<tr>
<td>12-15</td>
<td>Reference materials (other materials that may be valuable in some circumstances, but do not constitute effective practice)</td>
</tr>
<tr>
<td>16-18</td>
<td>Effective practice materials (the most relevant and valuable materials)</td>
</tr>
</tbody>
</table>

We also logged whether or not the resource was freely available on-line, since a number of valuable materials were found to be available only to members of relevant associations (e.g. PraxisUnico, UIIN).
Appendix C Taxonomies for knowledge exchange materials and resources

Our work has identified a range existing taxonomies used to categorise KE activities, materials and/or resources. These are presented below, mapped as closely as possible against HEFCE’s proposed categories.

<table>
<thead>
<tr>
<th>Outcomes of HEFCE consultation</th>
<th>CBR/PACEC study on KE infrastructure&lt;sup&gt;2&lt;/sup&gt;</th>
<th>PraxisUnico resource centre&lt;sup&gt;3&lt;/sup&gt;</th>
<th>UIIN Digital Library&lt;sup&gt;4&lt;/sup&gt;</th>
<th>University entrepreneurship: a taxonomy of the literature&lt;sup&gt;5&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communities of practice</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology transfer – Spin-out/licensing</td>
<td>Technology transfer</td>
<td>Commercialisation of R&amp;D results in science</td>
<td>Productivity of technology transfer offices</td>
<td></td>
</tr>
<tr>
<td>Research contracts and strategic partnerships</td>
<td>Facilitating research exploitation</td>
<td>Knowledge exchange</td>
<td>Collaboration in R&amp;D</td>
<td>Entrepreneurial research university</td>
</tr>
<tr>
<td>Skills and employability</td>
<td>Skills and human capital development</td>
<td>N/A</td>
<td>Curriculum development and delivery</td>
<td>Lifelong learning</td>
</tr>
<tr>
<td>Enterprise/Entrepreneurship</td>
<td>Entrepreneurship and social enterprise</td>
<td>Innovation</td>
<td>Entrepreneurship</td>
<td>New firm creation</td>
</tr>
<tr>
<td>Physical infrastructure – equipment and facilities</td>
<td>Exploiting the HEI’s physical assets</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Cross-cutting themes</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anchor and place-making role of universities</td>
<td>Supporting the community/public engagement Knowledge sharing and diffusion</td>
<td>Business &amp; community interaction</td>
<td>N/A</td>
<td>Environmental context including networks of innovation</td>
</tr>
</tbody>
</table>

<sup>2</sup> [http://www.pacec.co.uk/wp-content/uploads/2015/09/Understanding_the_Knowledge_Exchange_Infrastructure_in_the_English_Higher_Education_Sector.pdf](http://www.pacec.co.uk/wp-content/uploads/2015/09/Understanding_the_Knowledge_Exchange_Infrastructure_in_the_English_Higher_Education_Sector.pdf)

<sup>3</sup> [https://www.praxisunico.org.uk/Resources2](https://www.praxisunico.org.uk/Resources2)

<sup>4</sup> [https://www.uiin.org/index/digitallibrary](https://www.uiin.org/index/digitallibrary)

<sup>5</sup> [http://icc.oxfordjournals.org/content/16/4/691.abstract](http://icc.oxfordjournals.org/content/16/4/691.abstract)
<table>
<thead>
<tr>
<th>Leadership, management and broader environment</th>
<th>Leadership, strategy and institutional structures</th>
<th>Academic engagement</th>
<th>Governance</th>
<th>Entrepreneurial research university</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Other activities/themes</strong></td>
<td>Internationalisation</td>
<td>Academic mobility</td>
<td>Student mobility</td>
<td></td>
</tr>
</tbody>
</table>

### Appendix D  Abbreviations and Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerator Assembly</td>
<td>A European Commission-funded network which aims to develop a more informed understanding of the European accelerator ecosystem, acceleration best practices and potential areas for innovation to support European entrepreneurship.</td>
</tr>
<tr>
<td>ARMA</td>
<td>Association of Research Managers and Administrators</td>
</tr>
<tr>
<td>ASET</td>
<td>ASET is a membership-focussed organisation serving Higher Education Institution staff who deal with placements and other forms of Work Based Learning</td>
</tr>
<tr>
<td>AURIL</td>
<td>Association of University Research and Industry Links</td>
</tr>
<tr>
<td>AUTM</td>
<td>Association of University Technology Managers, a US nonprofit association of technology managers and business executives who manage intellectual property.</td>
</tr>
<tr>
<td>BIS</td>
<td>The Department for Business, Innovation &amp; Skills</td>
</tr>
<tr>
<td>Brunswick Group</td>
<td>An informal networking group for senior members of institutional research offices</td>
</tr>
<tr>
<td>CBI</td>
<td>The Confederation of British Industry</td>
</tr>
<tr>
<td>CBR</td>
<td>The Centre for Business Research</td>
</tr>
<tr>
<td>CIHE</td>
<td>The Council for Industry and Higher Education</td>
</tr>
<tr>
<td>CREST</td>
<td>The Consortium for Research Excellence, Support and Training (CREST) provides an innovative model for how to further research excellence and promote institutional and interdisciplinary collaboration.</td>
</tr>
<tr>
<td>DESC</td>
<td>DESC (Development of a Simplified Consortium Agreement) is a comprehensive Model Consortium Agreement which offers a reliable frame of reference for project consortia.</td>
</tr>
<tr>
<td>Easy Access IP</td>
<td>Easy Access IP is an international collective of Universities and Research Institutions who believe in creating impact from research outcomes via knowledge exchange.</td>
</tr>
<tr>
<td>EPO</td>
<td>European Patent Office</td>
</tr>
<tr>
<td>Equipment.data</td>
<td>Enables searching across all published UK research equipment databases through one aggregation “portal”, allowing greater accessibility with the aim to improve efficiency and stimulate greater collaboration in the sector</td>
</tr>
<tr>
<td>ERDF</td>
<td>European Regional Development Fund</td>
</tr>
<tr>
<td>GuildHE</td>
<td>One of two formal representatives bodies for higher education in the UK</td>
</tr>
<tr>
<td>HEIF</td>
<td>The Higher Education Innovation Fund</td>
</tr>
<tr>
<td>IASP</td>
<td>International Association of Science Parks</td>
</tr>
<tr>
<td>IEEP</td>
<td>The International Entrepreneurship Educators Programme</td>
</tr>
<tr>
<td>Innovate UK Innovation Commons</td>
<td>Commercial ‘space in common’, where UK universities, business consultants and forward-thinking investors come together to share ideas, opinions, expertise and resources</td>
</tr>
<tr>
<td>Institute for Manufacturing</td>
<td>The IfM is part of the University of Cambridge. It brings together expertise in management, technology and policy to address the full spectrum of issues which can help industry and governments create sustainable economic growth.</td>
</tr>
</tbody>
</table>
Interface - The knowledge connection for business is a central hub connecting organisations from a wide variety of national and international industries to Scotland’s 23 higher education and research institutes.

IPO
The Intellectual Property Office

Jisc
The UK higher education, further education and skills sectors’ not-for-profit organisation for digital services and solutions

KT Ireland
Knowledge Transfer Ireland

KTP
Knowledge Transfer Partnership

LEP
Local Enterprise Partnerships

LFHE
The Leadership Foundation for Higher Education

Licensing Resource Guide
Offers access to licensing services and resources (USA and Canada)

NACUE
The National Association of College and University Entrepreneurs

NASES
The National Association of Student Employment Services

National Academies
The National Academies of Sciences, Engineering, and Medicine are private, nonprofit institutions that provide expert advice on some of the most pressing challenges facing the USA and the world.

NCCPE
The National Coordinating Centre for Public Engagement

NCEE
The National Centre for Entrepreneurship in Education

NCUB
The National Centre for Universities and Business

NESTA
An independent charity that works to increase the innovation capacity of the UK.

NIH
The US National Institutes for Health

NIHR
The National Institute for Health Research

PraxisUnico
The national professional association for public sector knowledge exchange and commercialisation practitioners

RCUK
Supported by the European Commission and the OECD, HEInnovate facilitates the assessment of an HEI in a systematic way, opening up discussion and debate on the entrepreneurial and innovative nature of higher education institutions.

RCUK Research Councils UK

Science|Business Innovation Board
The Science|Business Board is a scientific association formed to improve the climate for innovation in Europe.

Setsquared
The SETSquared Partnership is the enterprise collaboration between the universities of Bath, Bristol, Exeter, Southampton and Surrey.

Small Business Charter
The Small Business Charter facilitates engagement between world-class business schools and SME & Start-Up communities with the core objective of creating sustainable positive economic growth for businesses nationwide.

Tech Transfer Central
Based in North America, Tech Transfer Central is designed to be a one-stop destination supplying information, news, products, and services for technology transfer and intellectual property professionals.

UIDP
University Industry Demonstration Partnership, based in the US

UIIN
The University Industry Innovation Network

UK-IRC
The UK Innovation Research Centre (UK-IRC) is a joint venture between the Centre for Business Research at the University of Cambridge and Imperial College Business School to further research and knowledge exchange on innovation policy and practice. The UK-IRC involved a large-scale, multi-year research programme and a Knowledge Hub to engage policy-makers and practitioners about innovation research.
<table>
<thead>
<tr>
<th>Entity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UKSPA</td>
<td>The UK Science Park Association</td>
</tr>
<tr>
<td>UMIP</td>
<td>University of Manchester Intellectual Property Limited</td>
</tr>
<tr>
<td>Universities UK</td>
<td>Universities UK members are the executive heads (vice-chancellors/principals) of UK university institutions which have met the criteria for membership agreed by the board of UUK.</td>
</tr>
<tr>
<td>WIPO</td>
<td>World Intellectual Property Office</td>
</tr>
</tbody>
</table>