

# Transferring information know-how

Information literacy at the interface between  
higher education and employment

A report for



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### Executive summary

This report examines the relevance of information literacy as a transferable attribute for individuals to take with them as they move from the realm of higher education to the world of professional employment. It presents and analyses the views and perceptions from a selection of players at the interface between higher education and employment, notably careers services, professional and accreditation bodies, employers and representative or specialist bodies relating to employment and skills.

The findings of the study suggest that:

- Information literacy is often regarded as an implicit component of more obvious attributes: not recognised as such, but inherent in or closely related to other competencies that are more widely sought after, such as analytical and problem-solving skills.
- For some professions, the ability to make sophisticated use of information and data is necessary for achieving professional competence and success; in such domains, there is a strong expectation that those entering the profession will be equipped with the appropriate information skills and know-how.
- Some disciplinary areas require considerable familiarity with the manipulation of information; and particular components of information literacy may additionally be explicitly set out as a contribution to the attainment of professional standards.
- Notwithstanding this, graduates often find it difficult to apply either to professional environments or to their own career development the sort of information know-how that they will have acquired in the course of higher education.
- The difficulties experienced by such individuals are a cause for concern; consequently, universities and employers should jointly reflect on how both sets of players might address the fostering of information know-how.

A greater recognition of information literacy as a set of interrelated attributes could benefit from an unpackaging of terminology, in two senses:

- Explaining what information literacy itself means, in order to set out clearly the skills, competences and capabilities that it relates to; and doing so where appropriate with reference to the distinct needs of different disciplines and sectors.
- From another perspective, demonstrating how the different attributes associated with IL contribute to generic concepts such as employability and gradueness.

A clarification might also provide a good basis for universities and employers to look at the respective and complementary roles that they must necessarily play in developing training, and thereby to reach a view of what each of the two sets of players can do best to ensure that future and current employees have appropriate levels of information literacy. There may even be a case for greater collaboration in this sphere between universities and employers in the devising and design of training content.

## Introduction, definition of information literacy and premise

1. This report presents and analyse views from a range of relevant players on the place and relevance of information literacy as a set of attributes that individuals take with them as they move from the realm of education to the world of professional employment.
2. Information is a fundamental building block for democratic and inclusive societies. The relationship that individuals, communities and organisations have with information in all its guises strongly influences their behaviour. The methods that are deployed to search for, discover, access, retrieve, sift, interpret, analyse, manage, create, communicate and preserve information and data are major factors in how people go about their business, develop their careers and play their part as informed citizens in the wider world. But they need help to take full advantage of their complex relationship with information. How members of society develop appropriate knowledge, understanding, skills and confidence, the support they receive, the training and educational opportunities provided for them, and the take-up of such opportunities are highly pertinent to the way that they relate to information. The capabilities that relate to acquiring this know-how are sometimes referred to as information literacy (IL). Although this is not a universally recognised term, it has the virtue of being succinct, and will be used throughout this report as convenient shorthand for what is described in this paragraph.
3. IL can apply to all the contexts in which members of society evolve, be it education (at all levels, arguably as early as primary school), research, employment, any form of activism and generally everyday life. IL has traditionally been of particular relevance to librarians – who, as information practitioners, are often responsible for teaching it, particularly in higher education settings – and to some academics, such as educationalists with an interest in information behaviour. Beyond such groups, the concept of IL is not widely recognised. However, a rather wider range of professional groups may understand, in more general terms, the importance of acquiring an ability and capacity to handle information; these groups include not just librarians, but also teachers, trainers, data managers, information scientists, researchers, professional bodies, accreditation bodies, employers, trade unions, policy-makers and the not-for-profit sector. This is the premise of the InformALL<sup>1</sup> initiative: a network that seeks to bring together diverse communities who wish to explore, in a cross-sectorial way, the relevance of IL to their respective agendas. InformALL provides a means of working collaboratively to capitalise on the perspectives, outlooks and expertise of the different groups of players, and brokering creative relationships between them.
4. As a contribution to providing this broad, inclusive view of IL, InformALL set out, as part of its 2014 programme of activities<sup>2</sup>, a project aimed at investigating whether and how IL is relevant for individuals moving from the realm of education to that of employment; in other words, whether and how IL forms a set of attributes that can be transferred from education to employment. In a knowledge-based economy and society, where the gathering, interpreting and deployment of evidence are crucial components, information capabilities are not superfluous. It is therefore opportune for InformALL to gather evidence on how IL is perceived

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<sup>1</sup> <http://www.researchinfolnet.org/infolit/ridls/> . Until June 2014, InformALL was known by its previous name, the Research Information and Digital Literacies Coalition (RIDLS).

<sup>2</sup> <http://www.researchinfolnet.org/wp-content/uploads/2012/01/RIDLs-2013-14-programme-proposal-website-version-FINAL-REVISED.pdf> . The programme is funded by the Higher Education Funding Council for England (HEFCE).

by a range of players at the interface between education (and in particular higher education) and employment; this evidence-gathering provides the basis for the following report.

### Methodology

5. The report is a synthesis of the views garnered during a consultation of selected stakeholders, who were asked, in the course of semi-structured interviews, to address a series of questions, set out at **Annex A**, relating to their perception of IL in the communities or organisations that they evolve in. The consultation was undertaken essentially during March, April and May 2014. Over the course of this period, 20 individuals from 17 organisations were interviewed, almost all by phone; they are listed at **Annex B**, and their input is gratefully acknowledged. In agreement with several of them, the views described in the report have been anonymised. Given the relatively small sample size, efforts were made to ensure as great a representative mix as possible; thus our respondents were broken down as follows:

- University careers services: 4
- Doctoral training: 1
- Professional and/or accreditation bodies: 5
- Individual employers: 4
- Representative or specialist bodies relating to employment and skills: 5
- Government Department: 1

Care was taken, in approaching and talking to respondents, to describe the issue without assuming any prior awareness of the term ‘information literacy’.

6. It is important to stress also that the report does not attempt to provide a fully-fledged analysis of the IL landscape as it might apply to the world of employment. There is a significant amount of literature available on IL and employability, usefully described in a review<sup>3</sup> published in June 2014 – many of whose conclusions bear similarity to the views that we have uncovered in the report. Although this is set out as a narrative, it restricts itself to presenting and comparing a range of views which, given the size of the sample of respondents, are inevitably selective. Moreover, there is much variation in the manner in which the different respondents reflected on and addressed the questions, so that the synthesis presents a snapshot rather than a comprehensive picture.

### Key points

7. The general picture that emerges from the consultation is that IL tends not be recognised as a term, and nor as a distinct and overarching set of attributes, even though generally there is an understanding of the relevance and, in many cases, the vital importance of know-how associated with the handling of information. The following deductions may be made:
- IL is often regarded as an implicit component of more obvious attributes: not recognised

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<sup>3</sup> Charles Inskip, *Information literacy is for life, not just for a good degree: a literature review*, CILIP, June 2014 - <http://www.cilip.org.uk/sites/default/files/documents/IL%20in%20the%20workplace%20literature%20review%20Dr%20C%20Inskip%20June%202014.%20doc.pdf>

as such, but inherent in or closely related to other competencies that are more widely sought after, such as analytical and problem-solving skills.

- For some professions, the ability to make sophisticated use of information and data is necessary for achieving professional competence and success; in such domains, there is a strong expectation that those entering the profession will be equipped with the appropriate information skills and know-how.
- Some disciplinary areas require considerable familiarity with the manipulation of information; and particular components of information literacy may additionally be explicitly set out as a contribution to the attainment of professional standards.
- Notwithstanding this, graduates often find it difficult to apply either to professional environments or to their own career development the sort of information know-how that they will have acquired in the course of higher education.
- The difficulties experienced by such individuals are a cause for concern; consequently, universities and employers should jointly reflect on how both sets of players might address the fostering of information know-how.

### Information literacy and employability

8. The term ‘information literacy’ is not widely known in employment settings. The respondents who were asked whether they have come across it mostly said that they hadn’t. More fundamentally, many of our interviewees suggested that the very notion of information-related know-how and competencies does not represent, in the eyes of the interests that they represent, a clearly-framed and recognisable package of attributes. For instance, the UK Commission for Employment and Skills (UKCES) is not aware of employers that articulate a clear need for IL, or that specifically take account of it when recruiting – even though they might tacitly recognise the absence of information competencies, for instance through concerns about poor problem-solving ability. This view from UKCES is underscored by the absence of references to any aspect of IL in its key surveys and studies:
  - *The Employer Skills Survey (2013)*<sup>4</sup>, which addresses skills including literacy in general, and problem solving – but says nothing specifically about information-related skills.
  - *The Future of Work study*<sup>5</sup>, which provides a horizon-scanning picture of key drivers for future employment trends, and a series of scenarios for the long-term development of the employment environment. It recognises the importance of factors such as digitalisation and big data, but essentially from a technological perspective; again, the document contains nothing about broadly-defined information-related skills and know-how.
9. The Confederation of British Industry (CBI) takes a similar stance: as the national body representing major employers, it does not pick up from its members any interest in or questions about IL-related issues; this corresponds to what some of our other interlocutors told us about employers not expressing a need for IL, or not discerning the absence of IL as a problem. Employability is a significant concern for the CBI, but information know-how does not figure

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<sup>4</sup> <http://www.ukces.org.uk/ourwork/employer-skills-survey>

<sup>5</sup> <http://www.ukces.org.uk/ourwork/future-of-work>

in this. As with UKCES, strategic CBI publications skirt around the issue:

- CBI-Universities UK report *Future fit: preparing graduates for the world of work* (2009)<sup>6</sup>, which explains the notion of graduate employability, what employers expect and what universities deliver. This is significant, because it reflects the perspective of the HEI sector, through UUK, as well as that of industry; one career advisor told us that this description of employability is well-recognised and important in her profession. Employability, as described, includes attributes such as problem-solving, teamworking and self-management, which all have implications in terms of ability to handle information – but nothing explicitly setting out information skills and know-how. Interestingly, employability does not appear to include reasoning ability and critical thinking, nor an aptitude to challenge – arguably attributes associated with a more critical use of information.
- CBI-National Union of Students report *Working towards the future: making the most of your time in higher education* (2011)<sup>7</sup>, charting the attitudes of both employers and students to employment skills as they are imparted in universities. This too carries a definition of employability, but with no reference to IL-related factors.
- *CBI Education and skills survey 2013*<sup>8</sup>, which is the latest available annual survey charting employers' attitudes to employment-related attributes among school and college leavers. Again, this contains nothing specifically related to information skills and know-how.

In 2013, a useful effort was made at relating the broad concept of employability to the more specific attributes associated with IL: the Open University has mapped each of the main CBI/UUK employability factors against relevant information and digital literacy skills, and on that basis has provided a clear tabular summary<sup>9</sup>. However, many obvious IL elements are missing, not least critical analysis of information sources and information creation – underlining the extent to which the employability attributes as defined by the CBI and UUK are arguably not comprehensive with regards to IL.

10. The picture is more nuanced with regards to the employability of individuals with PhDs. A report from the European Universities Association (EUA) on university-industry partnerships includes a list of attributes identified by employers as being important for recruits qualified to doctorate level<sup>10</sup>. In this list, the integration of ideas and resources from a wide pool of sources figures in 7<sup>th</sup> place out of 11. There is thus, for high-level entrants to the labour market, explicit recognition of an information-related skill – but it ranks well below others such as technical proficiency and originality/creativity.

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<sup>6</sup> [http://www.cbi.org.uk/media/1121435/cbi\\_uuk\\_future\\_fit.pdf](http://www.cbi.org.uk/media/1121435/cbi_uuk_future_fit.pdf)

<sup>7</sup> [http://www.cbi.org.uk/media/1121431/cbi\\_nus\\_employability\\_report\\_march\\_2011.pdf](http://www.cbi.org.uk/media/1121431/cbi_nus_employability_report_march_2011.pdf)

<sup>8</sup> [http://www.cbi.org.uk/media/2119176/education\\_and\\_skills\\_survey\\_2013.pdf](http://www.cbi.org.uk/media/2119176/education_and_skills_survey_2013.pdf); the results of the 2014 survey will be published during the summer of 2014

<sup>9</sup> The table is included in *Developing digital and information literacies through learning and teaching*, Open University Library Services, 2013 - <http://www.open.ac.uk/library/services/digital-and-information-literacy> (restricted access)

<sup>10</sup> *Collaborative Doctoral Education - University-industry partnerships for enhancing knowledge exchange*, 2009; see in particular pages 85-86 - [www.eua.be/typo3conf/ext/bzb\\_securelink/pushFile.php?cuid=400&file=fileadmin/user\\_upload/files/Publications/DO-C-CAREERS.pdf](http://www.eua.be/typo3conf/ext/bzb_securelink/pushFile.php?cuid=400&file=fileadmin/user_upload/files/Publications/DO-C-CAREERS.pdf)

11. Nevertheless, although the concept of IL is not generally well-recognised, when presented before and during the interviews with a description of it, our interlocutors had little problem in understanding its meaning, its relevance, and its distinctiveness from more familiar competences such as ICT skills; indeed, from some quarters, there was agreement that the term is a useful descriptor.
12. Digital literacy may be more widely recognised than IL, and there is much overlap between the two concepts<sup>11</sup>. One career adviser told us that her institution embeds digital literacy skills in career development; but this relates largely to areas such as appropriate behaviour with social media and personal networking, and is thus rather more specific than the broader range of capabilities encompassed by IL.
13. To a large extent, our respondents' understanding of IL is conditioned by the relationship that they see between it and other attributes or expectations with which they are more familiar. They thus acknowledge the contribution that IL can make to factors that are more obvious to them as employment pre-requisites: problem-solving ability, analytical skills, research skills, and to an extent, digital skills and the ability to handle large volumes of data; from the EUA, we heard a view pointing to the parallels between IL and statistical literacy, which also includes a strong focus on critical analysis of data. The relationship between IL and educational themes such as personal learning was also highlighted to us, as was the contribution that IL might make to rather more nebulous attributes such as professional attitude. One university career advisor summarised this view by suggesting that IL overlaps with a range of literacies and competencies, and that it is largely subsumed within other skills and areas of know-how that are valued by employers. Employers may thus implicitly appreciate the place of IL, without needing to make explicit references to it as a requirement or a desirable feature.
14. This underlines the relationship between IL and employability. The CBI explained to us that employability covers concerns such as personal skills, confidence, resilience, behaviour and attitudes. They recognise that IL may be associated with some of these generic attributes; for instance, confidence and resilience may be at least partly derived from a good knowledge of information sources – although there is no way of knowing to what extent IL is, in practice, a contributory factor. We heard that IL, implicitly associated with competencies such as research skills, can be said to form part of a package of attributes ('graduateness') that employers come to expect specifically when recruiting graduates. It is thus assumed that IL capabilities are imparted and enhanced through the undergraduate curriculum, and that academics address this in the coursework that they set. However, we did not pick up any evidence about whether this know-how is imparted in practice.

### Aspects of information literacy in particular employment settings

15. Although, as we have seen, IL does not figure as a distinct and encompassing set of attributes in the eyes of most of our interlocutors, there is recognition that aspects of it can be important components of the range of competencies expected in particular employment sectors. Some career advisors suggested that in industries such as publishing, accounting and financial services, know-how associated with the sophisticated handling of information and data is likely

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<sup>11</sup> Some have argued that information literacy and digital literacy are almost synonymous, and form part of a complex mesh of 'literacies of information' which also include media literacy, ICT literacy and others; see <http://designerlibrarian.wordpress.com/2014/04/24/digital-vs-information-literacy/>



to be crucial; employers in such sectors may therefore have expectations or requirements that relate to IL, and on that basis may promote relevant skills as part of their CPD. And within enterprises, particular groups of employees, such as learning technologists, may be attuned to changes in the digital landscape that have a bearing on IL.

16. More specifically, our discussions with individual employers revealed the extent to which the ability to make sound judgements about information in the workplace – what is sometimes referred to as ‘information discernment’<sup>12</sup> – features prominently in the expertise associated with different professional roles. The following two cases, described by two of our interlocutors who provided an insight into the philosophy and approaches of their respective companies in the engineering sector, illustrate how IL may underpin the attainment of high levels of expertise.

### **Example 1: nuclear technology**

In nuclear technology, the licensing and commissioning of a nuclear reactor involves a 10 to 15 year programme; this implies the need to access and use information over long periods of time. Such information is not always easy to find, so the way that it is managed is important, and archiving and curation represent organisational challenges. There is much reliance on the accumulated knowledge of experts within the organisation, and on people networks. The nuclear technology sector is relatively small and specialised, so the relevant experts are well-known and easily identified. Information capability is thus developed in-house, in a relatively informal way through personal contacts, on the basis of what people know and remember, rather than through established systems or training. However, although CPD takes place in this instance to meet the expectations of the relevant professional and chartered bodies, this does not specifically IL-related know-how. Such reliance on highly-skilled specialists with long-term experience is not dissimilar to the tapping into the knowledge base of academics and peer networks in university settings.

The sort of information that is required for business purposes in the sector is often very technical and detailed. Much of this is prescribed by regulators or utilities. There is rigorous quality assurance, to meet both commercial and legal obligations, with independent checking/validation of the information that is uncovered and set out. One practical example is the information relating to client safety cases, which are vital in the nuclear industry; writing up such cases is an important part of the job, and the information they contain must be meticulously compiled because it is scrutinised by regulators; its quality and provenance must therefore be carefully checked, in a process that is akin to critical analysis.

It follows that, to meet such professional requirements, there is a need to recruit individuals with a serious ability to handle complex information. Recruits are therefore likely to be high-quality people with strong intellectual and analytical abilities (i.e. academic skills), alongside technical capabilities. In these circumstances, there is an assumption that information know-how, particularly inasmuch as this relates to an ability to analyse information and data, is an integral part of the skillset of new starters.

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<sup>12</sup> Information discernment has been described as “the ability to use higher order thinking skills in order to make sound and complex judgements regarding a range of text-based materials” – see Walton, G. & Hepworth, M. (2013), *Using assignment data to analyse a blended information literacy intervention: a quantitative approach*, *Journal of Librarianship and Information Science*, 45 (1) pp53-63

### **Example 2: defense industries**

The imparting of knowledge is fundamental to a high-tech sector such as defense, and information-related skills are therefore vital. In this example, as with the case in nuclear technology outlined above, there is a strong reliance on the exchange of expert knowledge within the organisation. A number of mechanisms are in place to facilitate such exchange and thereby promote the sharing and obtaining of information. These mechanisms include:

- Knowledge communities, virtual networks that allow staff in different specialisms to exchange information and share expertise. This provides a recognised system for sharing information between engineers and technicians working across disciplinary boundaries, with the aim of improving project performance. Knowledge flows would be far more difficult without this established mechanism.
- Technical fellowships, a cadre of highly expert staff who form mentoring communities.
- 'Yellow Pages', a set of experts who act as recognised points of contact throughout the organisation, for staff members who require advice to resolve problems. Significantly, this mode of information acquisition, based on testimonials from real people, is deemed to be more effective for imparting knowledge than asking staff members to search for information through online resources.
- Life cycle management: this involves internal peer review of a project or a design, undertaken by an organisational expert, who undertakes the review based on established criteria.

For this company, the crucial underlying factor in information handling is the application of judgement; this determines the ability to look at information and understand the context in which it can be applied. Such an ability to know what is important is absolutely critical. This comes with experience, and cannot easily be acquired through training. Although ability of this sort is tested for as part of the recruitment process, in practice, these skills tend to become apparent only after a few years of service in the company. Decision-making skills, which are relevant here, are difficult to test for. Decision-making in professional environments, and ability to apply judgement, are not necessarily a graduate attribute, but more a product of experience.

The company does not expect every employee to have the full range of such skills. For instance, it often recruits mathematicians, who possess highly developed analytical skills, including notably data analysis – individuals such as these tend to be strongly focused on extremely specific and detailed approaches to information use. But other employees have a broader approach to the handling of information. The challenge is to ensure a good mix between different types of individual and their approaches to information handling, so that whatever the situation, information is filtered appropriately and deployed effectively to address given problems.

However, there is recognition within the company that imparting knowledge in these practice-oriented ways is more difficult with younger employees; this may be attributed to the way that generation Y staff pick up information, conditioned as they are by their social media habits. This represents an organisational challenge, particularly for an enterprise which operates in a sector which where security and confidentiality are important factors.

17. Both of these examples are drawn from specialised industries requiring highly-trained and technically very knowledgeable staff; the two cases are characterised by an emphasis on the development of information know-how through practice-based experience, including the acquisition and refinement of knowledge within informal and collaborative communities of

practice<sup>13</sup>. We heard also how the handling of information, as conditioned by business requirements, may differ in one significant respect from practices derived from academic methodology. In academia, particularly at postgraduate level, students require time to reach a point where they (and their peers) feel that they have found the correct answers and that excellence has been achieved. By contrast, in industry, timescales for reaching views are much more constrained, and employees may not have the luxury of ascertaining whether they are absolutely right. Thus the academic desire to seek, identify and analyse copious quantities of information clash with a business ethos build on turning over information more quickly in order to satisfy the needs of clients (there is an analogy with journalism, where tight deadlines may also get in the way of rigour).

18. This tension between approaches raises questions for IL in business settings, particularly with the challenge of keeping with a rapidly-evolving and specialised information environment:
  - What skills and aptitudes are needed to seek out and interpret information as effectively as possible where commercial pressures and time constraints apply?
  - How can informed decisions be reached without the rigour associated with academia?
  - How can effective handling of information be reconciled with business cultures characterised with a desire or an impatience to get on and achieve results, and where in-depth research might be deemed in some quarters to be irrelevant or inappropriate?

### Innovation and critical approaches to information literacy

19. In contrast with corporate attitudes founded on developing in-house information expertise, we heard a concern that employees in work-based environments (but also often learners in education) may be fed relatively controlled information, well-presented to address immediate requirements; a ‘bubble of truth’ made up of recognised information that meets the established needs of organisations and institutions. This could provide obvious immediate benefits for businesses, but such a relatively measured approach to information may be less conducive to thinking in an original or even critical way; and by extension, it may be detrimental to innovation, which is highly dependent on an aptitude to look out for new and frequently changing sources of information.
20. From a somewhat different perspective, trade unionists also face the challenge of developing a capacity for working with information that lies beyond established sources. The TUC’s Unionlearn programme<sup>14</sup> is a wide-ranging learning initiative that covers areas such as employment rights, health and safety, equal pay and other workplace issues. Although once again IL is not expressly recognised, the acquisition of information-related know-how permeates the programme. An important purpose of Unionlearn is to provide trade unionists with the tools, understanding and confidence to seek out and use information; but also,

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<sup>13</sup> The notion of developing information literacy as a collective competency in workplace communities of practice, through informal and unstructured learning, has been examined notably through the work of Annemaree Lloyd; see for instance *No man (or woman) is an island: information literacy, affordances and communities of practice*, Australian Library Journal, 54, 230-237 – <http://www.tandfonline.com/doi/pdf/10.1080/00049670.2005.10721760>

<sup>14</sup> <http://www.unionlearn.org.uk/>; Unionlearn sponsors courses for 50,000 union reps and a further 200,000 ordinary union members every year. The courses are taught by TUC-accredited tutors in a network of around 50 FE colleges across the UK, but are designed largely by Unionlearn, to ensure adherence to TUC standards and expectations.

crucially, to interpret and challenge information that is presented to them in the workplace, and where appropriate to create their own information sources (for instance through the teaching of survey methodologies) so as to give them the means to engage with and negotiate effectively with employers. The TUC's approach is encapsulated by its 'PIP' formula: problems – information – plan. This is founded on (i) defining a problem, (ii) becoming informed about it, and about how to tackle it, and (iii) planning for action. Underlying this practical approach is a desire to help employees think confidently for themselves about workplace issues. The TUC believes that this has a strong bearing on making sense of the world, on empowerment and democracy. There is a parallel here with innovation, through the use of information to challenge established habits and practices. This raises the question about whether IL, by allowing for a less constrained approach to information use, may contribute to public policy goals on fostering innovation.

### Information literacy as a professional attribute

21. Even though IL may not be perceived as a discernible knowledge area, it is clear that a sophisticated ability to handle information lies at the heart of some professions. To illustrate this re, we heard from the perspectives for chemistry, economics and statistics.

#### *Chemistry*

22. Information skills and know-how are fundamental for chemists in both industry and academia; they are deemed to be implicit within a range of soft transferable skills such as team working and presentational skills. Our interlocutors at the Royal Society of Chemistry (RSC) stressed the importance of searching, discovering, sifting and interpreting information. Their view mirrors what we were told by employers in the engineering sector: although universities should be expected to provide a good grounding to undergraduates in this area, true competency only comes through experience of handling information in professional settings – and this may take many years. Thus the view from RSC suggests that the role of universities is to impart generic skills that may be applied in many areas of employment; this is pertinent, given the large numbers of chemistry graduates who develop careers in non-chemistry environments, such as financial services.
23. There is no demand from employers in chemistry-related enterprises specifically for information-related know-how. The expressed needs of industry are for generic skills such as problem-solving, which reflects the views of the CBI on employability. But at the same time, some employers feel that graduates are not 'industry-ready'. Their view of such readiness may be coloured by the specific needs of their own industry; they may therefore have unrealistic expectations of what universities can do – there is a tension here with the idea that universities should focus on generic skills. Our interviewees suggested that chemistry-related enterprises now provide less on-the-job training than, say, 15 years ago – a consequence of the more difficult economic climate, the fragmentation of much of the industry (with relatively smaller enterprises not having the capacity to engage in effective training programmes), and higher turnover of staff, who are less likely than previously to pursue their careers within a single company. In such an environment, employers would do well to develop an appreciation of the role that they can play in developing staff, and to understand that this is not just a matter for higher education.

### *Economics*

24. Economists recognise the crucial importance of skills associated with the analysis of data, and also with the communication of such analysis. The profession requires familiarity with issues surrounding big data (discovering, handling, analyzing...), but also with the use of smaller datasets containing rich and qualitative data akin to what is produced in biomedical research through clinical trials, to help establish causality. For theoretical economists, the focus is often on plugging gaps where information is incomplete.
25. Such concerns have long been addressed by undergraduate economics courses, but there has been a more recent realization that information capability should be a key focus of studies, explicitly addressed by undergraduate teaching from the outset of the first year – enabling students to deploy information skills throughout their studies. Thus economics has probably done more than most other academic fields in integrating information knowledge and skills in the curriculum.
26. Our interviewee's experience as an academic economist suggests that undergraduates embarking on economics courses already have a good awareness of information-related issues, largely because his own department requires good maths A-level results (although the A-level curriculum may be less good at developing and enhancing capabilities related to data handling). Once at university, undergraduates tend to appreciate what they are taught about information handling, and recognise the contribution that this makes to their degrees. By the time they graduate, they have a solid awareness of the importance of these skills, not only for future employment purposes, but more generally to help with their understanding of the subject matter.

### *Statistics*

27. The role of statisticians is to produce information from raw data; the essence of the profession is to provide meaning to data. So, given that every single statistical skill is, one way or the other related to information, there is an evident need for statisticians, whatever field they work in, to acquire sophisticated information-related capabilities. The Royal Statistical Society thus feels that, generally, the skills requirements of employers are met. These requirements vary according to different sectors, such as pharmaceuticals, academia and government. For instance, in government, there is a strong emphasis on visualising and presentation know-how; this is less important in academia, where there is an obvious focus on technical skills.

### **Professional bodies, standards and accreditation**

28. The implicit information know-how that is expected by employers is reflected in expectations described by the professional and accreditation bodies that we spoke to. For these bodies too, IL is not recognised as a discrete set of attributes. Instead, specific and identified information-related skills and competences feature in the relevant standards devised for the purposes of accreditation of degree courses or of attainment of professional qualification. Such competences may also figure implicitly in a range of broader attributes relating notably to study and research methodology.

### *Engineering Council*

29. The Engineering Council is the UK regulatory body for the engineering profession, and sets

and maintains internationally recognised standards of professional competence and ethics, published in the UK Standard for Professional Engineering Competence (UK-SPEC). It is not a membership body as such: the diverse nature of the discipline is such that there are 36 different discipline-specific professional institutions that reflect the practices of, for instance, mechanical engineering (Institution of Mechanical Engineers) and civil engineering (Institution of Civil Engineers).

30. The Council's Accreditation of Higher Education Programmes (AHEP) document<sup>15</sup> prescribes graduate attributes, in the form of output standards, for Engineering Council accredited degree programmes that provide the underpinning knowledge and understanding for individuals seeking to achieve two of the four available professional qualifications: Chartered Engineer (CEng) and Incorporated Engineer (IEng). For both levels, the document includes information retrieval skills as an integral component of the general transferable skills that all qualified engineers are expected to acquire, alongside other related competences such as problem-solving; and also, as a contribution to engineering practice, the ability to understand, use and apply information from technical literature and other relevant sources. The document goes on to spell out expectations for the awarding of Bachelor's degrees that include "the ability [...] to make use of scholarly reviews and primary sources (for example, refereed research articles and/or original materials appropriate to the discipline)". But in addition to such explicit references to IL-related attributes, the document outlines a number of academic competences that imply a strong ability to handle information, relating notably to knowledge of the underpinning science and mathematics, and ability to undertake engineering analysis<sup>16</sup>.
31. UK-SPEC describes the levels of competence and commitment that must be demonstrated to attain CEng and IEng qualifications<sup>17</sup>. Here too, there are explicit references to IL-related factors: finding and evaluating information from a variety of sources (under the heading of contributing to the design and development of engineering solutions), and conducting statistically-sound appraisal of data (use of sound evidence-based approaches to problem-solving and contributing to continuous improvement).
32. The implicit and explicit references to IL-related competences underline the view from our interlocutor that, in engineering professions, know-how about information is taken to be an inherent part of the knowledge base – which explains why engineering organisations do not flag up information capabilities as a distinct set of issues.

### *Royal Society of Chemistry*

33. The Royal Society of Chemistry (RSC) is both the relevant professional society and the accreditation body for chemistry professionals. We have already seen that the RSC understands that information skills and know-how are fundamental for their members both in industry and

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<sup>15</sup> This is the latest edition of AHEP, published in May 2014:

<http://www.engc.org.uk/engcdocuments/internet/Website/Accreditation%20of%20Higher%20Education%20Programmes%20third%20edition%20%281%29.pdf>

<sup>16</sup> The implicit presence of IL in the standards for the engineering profession is analysed in greater detail in C Bradley, *Information literacy in the programmatic university accreditation standards of select professions in Canada, the US, the UK and Australia*, *Journal of Information Literacy*, 7(1), pp.44-68. As well as engineering, this article usefully charts the relevance of IL to the accreditation standards of two other professions: nursing and social work;

<http://ojs.lboro.ac.uk/ojs/index.php/JIL/article/view/LLC-V7-I1-2013-1/1814>

<sup>17</sup> <http://www.engc.org.uk/engcdocuments/internet/Website/UK-SPEC%20third%20edition%20%281%29.pdf>

academia. RSC accreditation, which relates both to university courses (at bachelor and masters levels) and industry training, is based on learning outcomes, rather than on particular processes; there is a strong emphasis on endowing students and professional chemists with transferable skills. The Chartered Chemist (CChem) professional certification is founded on a set of Professional Attributes<sup>18</sup>; these are a set of a dozen criteria which, again, relate to broad outcomes. Significantly, one of these refers to the ability to “evaluate critically and draw conclusions from scientific and other data”.

34. More precisely, the RSC Accreditation of Degrees Programme<sup>19</sup> contains several clear references to IL-related competences in the long list of key requirements (KRs) for accreditation for both bachelors and masters. These include:
- under KR7 (independent investigative methodology): ability to undertake literature investigation;
  - under KR7 (transferable skills): requisite transferable skills include data handling;
  - under KR12 (assessment process): assessment programmes should seek to ensure that students are encouraged to critically analyse information.
35. Moreover, the Accreditation of Degrees Programme makes several references to the expectations set out in the QAA chemistry benchmark statement<sup>20</sup>. These also include specific references to IL-related competences:
- under subject knowledge and understanding: recording of data and their critical analysis;
  - under abilities and skills: skills in the evaluation, interpretation and synthesis of chemical information and data; and information retrieval skills, in relation to primary and secondary information sources, including information retrieval through online computer searches.

### *Royal College of Veterinary Surgeons*

36. As with RSC, the Royal College of Veterinary Surgeons (RCVS) serves both as a professional body and a regulator. It is aware of the importance of information-related know-how and skills, which are highly relevant in this field and thus are built into a number of key documents (see paragraph 36 below). However, IL-related competences are not expressly addressed by professional development in veterinary medicine and nursing. Nevertheless, practitioners have a responsibility to ensure that they maintain and develop the knowledge and skills relevant to their professional practice and competence and each individual will make a judgement on the CPD that they need to undertake to fulfil their own learning needs. In practice, a proportion of veterinary professionals appear to lack the skills properly to perform tasks such as searching for, discovering and interpreting information; there are shortcomings too in data management and statistical analysis (for instance, insufficient analysis of data from veterinary practice management systems, such as clinical audits). It was suggested to us that information know-how acquired during the years of pre-qualification study is not always applied perhaps because

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<sup>18</sup> <http://www.rsc.org/Membership/Qualifications/CharteredStatus/attributes-cchem.asp>

<sup>19</sup> [http://www.rsc.org/images/Accreditation%20Criteria%20January%202012\\_tcm18-151306.pdf](http://www.rsc.org/images/Accreditation%20Criteria%20January%202012_tcm18-151306.pdf)

<sup>20</sup> <http://www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Subject-benchmark-statement-Chemistry.aspx>

of poor habits picked up in working environments.

37. There are a number of key documents that set out professional expectations and requirements and examples are given below; these include factors that are clearly relevant to IL:
- *Day One Competences*<sup>21</sup>: a document that sets out the minimum essential competences that the RCVS expects all veterinary students to have met when they graduate, to ensure that they are safe to practise on day one, in whichever area of the profession they start to work. Among the long list of competences set out in the document are three that are particularly relevant: (i) be able to review and evaluate literature and presentations critically; (ii) demonstrate ability to cope with incomplete information, deal with contingencies and adapt to change; and (iii) access the appropriate sources of data on licensed medicines
  - *Year One Competences*, which are set out in the *Guidance on the Professional Development Phase (PDP)*<sup>22</sup>. The PDP exists to help support new graduates as they begin their careers in clinical practice. It is compulsory for all those working in clinical practice who have graduated since 2007. The PDP aims to help new graduates turn their Day One Competences, the set of skills with which they leave veterinary school, into Year One Competences.” The *Year One Competences* are more detailed than the *Day One* equivalent, and include similarly relevant factors, although they are framed a little differently; they include a whole section on underpinning knowledge and understanding, covering such requirements as capacity to evaluate evidence and to deploy appropriate research methods.
  - The Certificate in Advanced Veterinary Practice<sup>23</sup>, which is accredited by RCVS and may be completed at least three years following a first degree. Not all veterinary surgeons acquire the Certificate, but numbers are growing. It is a modular course offered by approved universities, and includes a compulsory module (Module A – Foundations of Advanced Veterinary Practice<sup>24</sup>), incorporating a list of key skills “which candidates may need to develop and consciously apply”. Several of these are information-related, including:
    - referencing systems;
    - bibliographical resources, archives and other sources of information;
    - literature search strategies and enquiry techniques;
    - critical appraisal;
    - identifying, analysing and evaluating relevant information;
    - managing information, including understanding professional and legal requirements relating to clinical, professional and research data.

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<sup>21</sup> <http://www.rcvs.org.uk/document-library/day-one-competences-updated-march-2014/>

<sup>22</sup> <http://www.rcvs.org.uk/document-library/guidance-on-the-professional-development-phase/>

<sup>23</sup> <http://www.rcvs.org.uk/education/postgraduate-education-for-veterinary-surgeons/certificate-in-advanced-veterinary-practice/module-subjects/>

<sup>24</sup> <http://www.rcvs.org.uk/document-library/a-favp1-foundations-of-advanced-veterinary-practice/>



### *Royal Economics Society and Economics Network*

38. The Royal Economics Society (RES) is a learned society and to a lesser extent a professional body. It does not have an accreditation role, and nor does it engage to any extent in CPD, although it supports postgraduate and academic staff through activities such as training days. It does not directly address the issue of information know-how. Within the UK economics community, provision of disciplinary training resources (particularly for economics teachers) is addressed instead by the Economics Network, an organisation that grew out of the Higher Education Academy and which is now part-funded by RES. The Network has formulated a statement<sup>25</sup> on ‘What skills will economics give you?’, geared to undergraduates. The list of these skills, with a strong focus on analysis and critical thinking reflects the extent to which the handling of information and data is inherent to economics as a discipline, as outlined above. Most directly relevant, the list includes marshalling evidence and assimilating, structuring and analysing qualitative and quantitative data; and applying literary and information-processing skills.

### *Royal Statistical Society*

39. The Royal Statistical Society is both a professional and an accreditation body, and information-related capabilities are central to its work. There are benchmarks that underpin the two levels of professional qualification (Graduate Statistician and Chartered Statistician), and these serve as basis for accreditation standards<sup>26</sup> that apply to university courses at undergraduate and MSc levels. RSS does publicly not set out detailed criteria that underpin these standards, but the syllabus description<sup>27</sup> relating to the three levels of examination run by the Society (Ordinary Certificate, Higher Certificate and Graduate Diploma) is more explicit about IL-related attributes. The various modules provide detailed descriptions of expectations relating notably to data collection, compilation, analysis and presentation.

## Challenges to be addressed

40. We have seen how, to varying degrees, the handling of information and data is recognised implicitly by employers and professional bodies as an important component of what constitutes a rounded graduate employee. And in some cases, relevant skills are highlighted very clearly as professional attributes. At the same time, several of our interlocutors have suggested that information know-how is assumed to be part of the package of skills and competences that graduate employees acquire during the course of their studies.

### *Challenges and difficulties in the transfer of know-how*

41. This assumption may be misplaced, and we heard concerns about whether universities are really doing enough to equip graduates with appropriate know-how. One career adviser indicated that some larger graduate recruiters merely pay lip-service to digital competency (she understood this to be closely related to IL) without dwelling on whether this really forms an integral part of the knowledge acquired by graduates. We heard from several of our sources that, by the end of their studies, many graduates are not proficient in the critical analysis of

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<sup>25</sup> <http://whystudyeconomics.ac.uk/After-you-graduate/what-skills-will-economics-give-you/>

<sup>26</sup> <http://www.rss.org.uk/site/cms/contentCategoryView.asp?category=292>

<sup>27</sup> <http://www.rss.org.uk/uploadedfiles/userfiles/files/Syllabus%20for%202014%282%29.pdf>

information, the understanding of the nature of information sources and the understanding of even basic statistical concepts. They may have a tendency to take information at face value, to be too trusting of sources that are superficial or not evidence-based, particularly if these are attractively presented. They therefore may tend to behave as uncritical consumers. One interlocutor suggested that, well before the start of university education, individuals need to acquire a mindset that fosters more critical approaches towards statistical information and the validation of data; there is a need for educators to encourage in school students a predisposition to challenge assumptions, including assumptions that are widely-shared. Students may have well-developed technical digital skills, but that does not equate to information-related know-how. ICT skills are conflated with IL skills in the minds of many students, academics and employers, and this can serve to reinforce mistaken assumptions.

42. To underline these points, one engineering employer told us that, during assessments that form part of the recruitment process, applicants often appear to have difficulty in assimilating, interpreting and analysing the information, including numerical data, which is given to them – and therefore require guidance about how to complete the task to be accomplished). Our interlocutor at EUA has similarly identified poor levels of statistical literacy among policy-making organisations – all the more worrying given that such organisations have a responsibility for producing evidence-based outputs; he opined that the pressure to produce results for clients, including easily-assimilated messages in the form of soundbites, might contribute to careless approaches to statistical data handling. This illustrates the challenge, as outlined in paragraphs 17-18, of reconciling rigour with commercial expectations.
43. Difficulties may also stem from confusion about the respective roles of universities and employers in imparting relevant know-how. We have seen how some employers suggest that universities should focus on equipping students with generic capabilities, which would as a matter of course incorporate a degree of information literacy, leaving employers themselves to provide environments where more specific information know-how is acquired. But we heard the view that students may be put off by generic training if they deem this to be too general and abstract; they might engage more with training that provides some context enabling them to understand the importance of the knowledge imparted not just for academic study, but also for their professional careers.
44. At the same time, it is legitimate to ask whether in-house mechanisms which rely on experience for developing abilities to discover, share and handle information are sufficient – and if so, whether they will remain sufficient in a changing world characterised by increasingly diversified lifelong career paths and rapidly-evolving information landscapes which themselves generate new information habits and practices (one of our respondents recognised this by stressing the challenge of imparting specialist knowledge to generation Y employees – see example 2 above).

### *Challenges and difficulties in employment searching and career management*

45. Careers advisers understand the importance of effective use of information for students looking to embark on their professional lives. The Association of Graduate Career Advisory Services (AGCAS) indicated that IL-related skills are crucial because graduates need them in order to become aware of career opportunities and to support informed decisions about career choices; this is important not just with regards to choosing employers or moving into new sectors, but more fundamentally in relation to supporting strategic career decisions throughout working

lives; as such, IL has a bearing on lifelong skills. But several career advisors expressed their disquiet about the frequent inability of undergraduates to apply their academic information know-how to the practical requirements of job-seeking and making informed choices about careers. Students often appear unable to transfer to the world of employment any critical judgement and research skills acquired through their studies (assuming, as suggested above, that such skills are properly-acquired in the first place); confronted with the large amount of information on employment opportunities which drives the recruitment market, they may feel overwhelmed and at a loss about how and where to seek relevant material and documentation, often displaying poor awareness of sources such as specialist databases, other than what is readily and obviously available on the internet. Faced with these weaknesses, careers advisors may feel obliged to provide services, such as information portals, that simplify the task for their students; but in doing so, they are providing an immediate palliative rather than addressing the underlying problem of students' apparent difficulty in finding a way through the information maze.

46. Employers have their own expectations about students' ability to make intelligent use of career and employment-related information. One career adviser told us that recruiters expect potential employees thoroughly to research and analyse the vacancies and opportunities offered by companies, in order to ensure that their applications are properly formulated. In a competitive job market, applicants must be able to apply information skills gained through research not only to gather intelligence on prospective employers, but also to reflect on self-information: what they can say about themselves and their underlying skills, competencies and experience, beyond the mere submission of an academic CV.
47. In a similar vein, career advisers expressed their concern that graduates often do not display or communicate the ability to put their information skills to use for the purposes of furthering their post-university careers. Graduates (and, on the basis of one example highlighted to us, perhaps postgraduates too) often do not appreciate how employers see the value and applicability of such skills; at the same time, they show a lack of understanding about how they might demonstrate and transfer those skills from academic environments to other situations. It was suggested to us that academics (as opposed to careers advisers) are often not adept at highlighting the relationship between such skills and employability; and that education in the UK focuses too heavily on end-points, notably in the form of exams, to the detriment of lifelong skills that incorporate IL.

## Conclusions

48. It is clear from the views that we have collected that the importance of individuals' ability and capacity to handle information in employment environments is, at the very least, understood by careers advisors, professional bodies and employers – even if only implicitly for some of these players. Many of our interlocutors go further, by acknowledging the centrality of information-handling to their professional practices or standards. Their precise interpretation of information-handling varies according to context, and it does not equate to the full range of skills, competences and capabilities associated with IL as defined in the introduction to this report. Nevertheless, aspects of IL are present in the thinking of most of our interlocutors, even though they mostly do not recognise the term and the concept.
49. A greater recognition of IL as a set of interrelated attributes could benefit from an unpacking of terminology, in two senses:

## Transferring information know-how

- Explaining what IL itself means, in order to set out clearly the skills, competences and capabilities that it relates to; and doing so where appropriate with reference to the distinct needs of different disciplines and sectors.
- From another perspective, demonstrating how the different attributes associated with IL contribute to generic concepts such as employability and graduateness.

Such clarification might usefully be articulated around a simple flow-chart:



50. A clarification might also provide a good basis for universities and employers to look at the respective and complementary roles that they must necessarily play in developing training, and thereby to reach a view of what each of the two sets of players can do best to ensure that future and current employees have appropriate levels of IL. There may even be a case for greater collaboration in this sphere between universities and employers in the devising and design of training content.
51. It is inappropriate to draw solid conclusions from a relatively limited consultation exercise, but it is hoped that the evidence garnered can at least serve as a basis for a dialogue between interested parties, and an exploration of whether and how a better understanding of IL might help to highlight its relevance to factors such as employability, career development, critical thinking and innovation that are instrumental in securing a smooth and enriching transition from education to employment.

## Annex A

### Background information and questions for interviewees

We are gathering data on the topic described below and would like to request a short (approx. 30 minutes) telephone conversation with you or an appropriate member of your organisation to enable you to feed in your views.

In an information society, it is important for people to be equipped with the skills, competencies and know-how needed to search for, discover, access, sift, interpret, analyse, manage, preserve and retrieve ever-increasing volumes of information. These capabilities are critical for individuals to function as learners, employees, employers and citizens; and to keep up-to-date with developments in their field. Ways of presenting and using information evolve; the skills, competencies and know-how needed to do this must do so as well.

The Research Information and Digital Literacies Coalition (RIDLs) is a publicly-funded, collaborative network with an interest in these issues. We wish to develop our understanding of the place of information-related capability in the policy and practice of organisations that lie at the juncture of formal education and employment. Professional and accreditation bodies are obvious players in this sphere, with a stake in professional development and setting professional standards, and in supporting the training needs of members; we are therefore interested in having a short conversation with you during which we would like to cover the following broad questions:

Professional / accreditation bodies	Employers / employment-related organisations	Careers advisors / services
In your profession, is there a need for this information-related capability?	In your field of employment, is there a need for this information-related capability?	In your dealings with students, universities and employers, is there a need for this information-related capability?
Do you feel that individuals entering your profession are sufficiently equipped with the relevant information skills and know-how? And if not, what are the gaps?	Do you feel that individuals that you recruit are sufficiently equipped with the relevant information skills and know-how? And if not, what are the gaps?	Do you feel that individuals that you advise are sufficiently equipped with the relevant information skills and know-how? And if not, what are the gaps?
What place does this capability have in the policy and practice of your organisation? <a href="#">[For accreditation bodies]</a> Does in feature in the professional standards that you set?	What place does this capability have in the policy and business undertakings of your organisation?	What place does this capability have in the policy and practice of the service that you offer?
<a href="#">[For professional bodies]</a> Is there demand from your members for professional development/training in this area? Do you run training or CPD activities that relate, directly or indirectly, to the acquisition or development of relevant skills and know-how? How else might this capability be developed (either by your organisation, or outside it) in your profession?	Is there demand from your employees for professional development/training in this area? Do you run training or CPD activities that relate, directly or indirectly, to the acquisition or development of relevant skills and know-how? How else might this capability be developed (either by your organisation, or outside it)?	Is there demand from employers that you deal with for professional development/training in this area? Do you run training or CPD activities that relate, directly or indirectly, to the acquisition or development of relevant skills and know-how? How else might this capability be developed?

We aim to build a picture of how information-related capabilities are perceived and addressed. This will be made publicly-available, and we hope that it will be of interest to organisations that we will have spoken to.

## Transferring information know-how

In addition to professional and accreditation bodies, we are seeking views from other stakeholders such as careers advisors, employer organisations and specialist bodies.

We hope that our conclusions, and our conversation with you, will serve as a useful prompt for you to reflect on related issues. Finally, if this area is of interest, we would be happy to continue our dialogue with you, to help you develop your thinking, and to put you in touch, through the RIDLs network, with other parties with which you might wish to exchange views; for instance, we are envisaging the possibility of a workshop or symposium later this year.

## Annex B

### List of interviewees

Name	Organisation
Roeland Beerten	Director of Professional and Public Affairs – Royal Statistical Society
Alan Beesley	Director Learning & Development - SELEX
Nigel Biggs	Entrepreneur-in-Residence – University of Surrey Director – Passionate Innovation
Clare Boulton	Head of Library & Information Services – Royal College of Veterinary Surgeons (RCVS)
Grace Breen	Policy Adviser, Education & Skills – Confederation of British Industry (CBI)
Nick Breeze	Cabinet Office
Katherine Chapman	UK Commission for Employment & Skills (UKCES)
Kate Douglas	Director of Employability – Middlesex University
Julie Franklin	Careers Specialist – Royal Society of Chemistry
Frances Gow	Employability Manager – University of Westminster
Clare Jones	Senior Careers Adviser – University of Nottingham
Thomas Jørgensen	Head of Unit (Council for Doctoral Education) – European Universities Association
John Lillington	Chief Technologist, Nuclear Reactors – AMEC plc
Gemma Minish	Campus Marketing Manager, Emerging Talent – Thales UK
Alison Morris	UK Commission for Employment & Skills (UKCES)
Robin Naylor	Second Secretary – Royal Economics Society Director of Undergraduate Studies, Economics Department – University of Warwick
Sarah Peers	Director of Programmes – NRF: The Innovation Institute
Deborah Seddon	Head of Policy & Standards – Engineering Council
Helen Stringer	Careers Services Manager – University of Warwick
Tom Underwood	Accreditations & Qualifications Manager – Royal Society of Chemistry
Tom Wilson	Director – TUC Unionlearn
<b>Additional contributions from:</b>	
Tina Barnes	Principal Teaching Fellow – University of Warwick
Geoff Walton	Lecturer in Information Sciences – Northumbria University

Further organisations that were approached, but which did not respond or declined to take part:

- Go-On UK
- Institute of Physics
- Quality Assurance Agency (QAA)
- Royal College of Physicians