

**A STUDY OF  
INTERNATIONAL SCIENCE  
COLLABORATIONS –  
PART 1**

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**SQW Consulting**

Interim report to the Scottish Executive  
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## INTRODUCTION

1.1 This is a report on the first of a possible three phase study into the nature and scale of international science collaborations involving researchers and their host organisations based in Scotland<sup>1</sup>. The study is concerned with the university sector, research institutes and the NHS in Scotland. In terms of determining the scale of science collaborations, the overall study is intended to focus on those involving China and the USA, two of the priority countries within the Scottish Executive's international strategy.

(Since this report was commissioned and drafted, the Scottish government has changed. The rationale for this work was conceived under the previous administration. The strategies, objectives and commitments referred to in the report should not therefore be treated as *current* Scottish Executive policy.)

1.2 This first phase of work has been exploratory. It has involved a limited expenditure of study resource to consult with a small cross-section of informed individuals in different kinds of organisations in Scotland involved in international science collaborations:

- two large, research-intensive universities
- one less research-intensive, but internationally active university
- one research institute
- one large university hospital trust.

1.3 Annex A lists the consultees who provided information. Annex B contains the results of initial desk research into public domain sources of information on collaborations.

### Scope

1.4 In this initial phase of the study we adopt the following scope:

- *Science*: to include science, technology, engineering and mathematics (STEM)
- *Activity*: to include research, post-graduate research training and knowledge transfer links, but not education and other training
- *Links*: to involve Scotland-based researchers, research groups and institutions with international peers in HEIs and institutes, and with individual researchers and organisations in the private sector internationally

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<sup>1</sup> This study has been conducted by SQW Consulting in collaboration with Dr Geoff Gregson, University of Edinburgh Management School.

- *Geographic focus:* developing a *generic* understanding of international scientific collaborations and then focus down on the feasibility of obtaining in the short term a measure of existing collaborations with the USA and China
- *Type of measures:* developing a *generic* understanding of what measures would be most appropriate, and feasible to use without incurring unacceptable time/ cost. Then focus down on feasibility of obtaining measures of current funded projects and recent joint publications involving China and the USA.

1.5 Our exploratory research with consultees sought to elicit information on the following:

- the kinds of international scientific collaborations that are undertaken by institutions and their staff
- why the various types of collaboration are established – what are the reasons, motivations, incentives behind them?
- the prior inputs and activities required to enable the various types of international collaboration to be established
- the nature of any records (databases) of international scientific collaborations:
  - for those involving individual staff members
  - for those involving groups/units within the institution
  - at the level of the institution itself
  - specifically any records of joint research publications by staff with co-authors in other countries, including China and the USA
  - any records of funded research and knowledge transfer projects with researchers/organisations in other countries, including China and the USA
- if records are kept for any of the above, in what form, and would the institution be able and willing to provide data to the Executive specifically on collaborations with USA and China? If so, what if any conditions would apply?
- if no records are kept, what might be possible, not incurring unacceptable costs, in order to obtain measures of collaboration with China and the USA?

- specifically what might be feasible in terms of measures of co-authored publications and collaborations in funded projects with the China and the USA?

1.6 This exploratory research was not intended to acquire data on collaborations directly, but rather to indicate what might be feasible in terms of a survey of institutions and/or their staff in a possible third phase of the commission.

## RESEARCH FINDINGS

2.1 This section presents the findings from the consultations. It sets out in full form responses to questions from five different sources in order to provide a good picture of diversity of view and of the challenges ahead in obtaining a comprehensive and standardised register of international science collaborations.

### **Describe the kinds of international scientific collaborations that are undertaken by your institution and its staff:**

2.2 The extent of collaboration with the US compared to the EU appeared to vary between the large research intensive universities that were consulted. Collaborations with the US were prominent in the examples given by one large university:

- a collaboration with US researchers on the subject of gravitational waves
- industrial contracts with major US pharmaceuticals companies (e.g. Wyeth), achieved on the back of this university's reputation for research excellence
- individual partnerships with other academics in the USA
- with the Semiconductor Research Association in the USA (an industry organisation that includes Intel, IBM etc.) which has signed a PhD funding agreement with the university
- research contracts with Motorola.

2.3 Our consultee from the other large university reported that its collaboration with EU partners far exceeds collaboration with the US. The vast majority of international scientific collaborations by its scientists are with European colleagues through the EU's Framework Programme. Approximately 170 such collaborations have been undertaken. This university has approximately 800 research partners, the majority from European Union (EU) countries.

2.4 With the exception of the US National Institute of Health (NIH), the latter consultee could not point to a major collaboration with the US other than one with Stanford University. Little scientific collaboration involves China, in part because of the lack of enabling research funding, although it is expected that a newly established specialist centre within the university may stimulate collaborative opportunities<sup>2</sup>.

2.5 One of the research intensive universities identified potential benefit from gaining more support for international activities through participation in Scottish Enterprise's Global Companies scheme.

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<sup>2</sup> See <http://www.ed.ac.uk/news/060321confucius.html>.

2.6 According to the consultee from a third university, the institution currently has few international science collaborations. Those international collaborations that are in place include:

- *consultancy*, including various projects with Hong Kong in shipping and maritime movement, involving both the Hong Kong Port Authorities and government (this university is a Scottish research focus for transport studies)
- in *biological sciences*, development of sensors to detect arsenic contamination of groundwater is proceeding with partners in the US and in India
- a past member of staff has left to head-up the Hungarian Institute of Science, which has led to joint projects *in materials development*
- some international collaborative activity occurs in the area of *medical technology*.

2.7 The research institute we consulted identified two main types of collaboration:

- *formal collaborations*: institution-to-institution, with the signing of memoranda of understanding. This happens on a national and international basis – c.15 international agreements, including some with China (c. 6). There are no MOUs signed with institutions in the USA. At least half of the 15 international collaborations are described as ‘real’, with staff exchanges occurring within the last 18 months, including to China, Australia and Peru. The extent of the exchanges depends on the research project and the money available, and can involve two-way exchange of staff
- *informal collaborations*: scientist-to-scientist collaborations, which are numerous and extensive, and which include links with both China and the US.

2.8 Our NHS consultee identified several hundred staff at the hospital with roles as consultants and active researchers. From the consultee’s own experience and that of colleagues, collaborations involving the hospital fall into several categories:

- *large pharma trials*: large scale clinical trials, for example the hospital has been involved in a number of multi-centre clinical trials that have been landmarks in their field, and involved 10-15k patients across the world. In the past there would have been some Scotland-only trials, but large pharma now tends to operate trials internationally
- *smaller pharma trials*: smaller, but no less important. These collaborations tend to occur at the level of an individual research group and involve around 100 patients. They generally involve the research group approaching a pharma company with a proposal rather than the other way round. At the moment the hospital is setting up these types of trials with groups in Australia, France and Finland

- *membership of European Framework Programme networks*: with participation currently in c. 2 of these under Framework Programme 6

2.9 The NHS consultee also identified collaborations in tools and technology platform development, as well as in pure research. For example, the functional code for Siemens ECG machines was developed in this university hospitals trust: this resulted in the formation of additional collaborations.

**Why are the various types of collaboration established – what are the reasons, motivations, incentives behind them?**

2.10 Regardless of where they work, academics get involved in collaborations for the same reasons they get involved in research – “its fun”. Academics have a deep interest in their subject and collaborations provide an opportunity to work with like-minded people. It also gives them international esteem, and given the way that much research requires large multi-disciplinary teams nowadays, it may actually need an international collaboration to take the work forward.

2.11 The same holds true in the NHS according to our consultee – research staff are engaged in technically demanding studies, either because they are complex or require the participation of large numbers of patients, or both. A large numbers of centres are often involved to obtain access to patients and/or equipment.

2.12 Collaboration also provides the opportunity to access and benefit from the complementary knowledge, skills and resources possessed by international peers. Without academics leading the collaborations, one large university suggested that it is unlikely that institutional collaborations will be successful. Most scientific collaborations are therefore established as peer-to-peer collaborations.

2.13 It was suggested by one consultee from a large, research intensive university that publication in leading peer-reviewed journals remains the primary incentive/output for scientific collaboration, stimulated by the Research Assessment Exercise (RAE).

2.14 In terms of working internationally, many academics do not necessarily set out with this as a target, but for example in biosciences a large amount of research is being funded by organisations in the USA. As a result, there are very good researchers based in the USA with whom it is exciting and beneficial to collaborate. Similarly, China is recognised by academics as a research leader of the future, with excellent research in IT and telecoms in particular. Good researchers want to be internationally competitive and have an international reputation.

2.15 In terms of incentives, where a university is trying to create strategic alliances, there is some funding available to ‘oil the wheels’. A consultee from a large, research intensive university suggested that staff recognise international collaborations as a “good thing” in which to be involved - for example, it is considered very favourably in applications for promotion. For one university building strategic alliances in the US and in Africa, the institution is supporting travel opportunities for staff, which also incentivises staff to get involved.

2.16 Some scientific collaboration is driven by a combination of fundamental and applied research coupled to funding incentives. For example, since the late 1980's, Fujisawa Pharmaceutical Co of Japan has had a long-standing research exchange with one of the research intensive universities consulted during this study. This has allowed university-funded scientists and Fujisawa employees to work and study together. It has provided the university not only with significant external research funding, but allowed university scientists to develop more applied applications from their pharmacological research work. This high-profile collaboration was driven by an explicitly stated research integration and exchange strategy negotiated by senior representatives of the university and the Company. Our consultee suggests that this has resulted in research outputs of higher quality.

2.17 A consultee from a research intensive university pointed to the increasing importance being given to 'commercialisation' as a driver for larger scientific collaboration - as seen by institution-level collaboration in for example the Edinburgh-Stanford Link (ESL). Although its primary motivation is fundamental research collaboration and exchange, there is a strong applied research objective, driven by Scottish Enterprise (SE) funding: "*to establish Scotland as a global leader in the commercial development of speech and language technology, and boost the country's reputation as a centre for research and design*". The creation of new companies based on speech and language technology from the programme was a target output.

2.18 However, the commercial output of spin-out companies is directly linked to two other longer-term expected outputs of the ESL - to generate new entrepreneurial activity among academics/postgraduates in speech and language technologies and to generate interest from private companies to engage with the university in applied research and commercialisation of new technologies. A further benefit of the international collaboration achieved by the ESL has been a new collaboration between the Scottish university and Stanford's Office of Technology Licensing. The former has benefited from staff and knowledge exchange leading to improvements in its methods to stimulate academic research and its commercialisation.

2.19 Most sponsors of research now require universities to identify how research outputs will be leveraged to maximum effect: therefore, future scientific collaborations at the research intensive university in question are likely to include consideration of a broader knowledge transfer agenda. Making the best of what comes out of each collaboration, in terms of academic, commercial and knowledge transfer effects, will remain a key responsibly for all universities.

2.21 Collaborations taking place in the less research intensive university consulted are commonly on an individual staff level. Activity is very often built on individual staff contacts and exchanges. Some of the collaborative activity is with companies (about 50%), predominantly consultancy on the back of contacts with entrepreneurs in particular subject areas. However, the university only tends to be aware (centrally) that collaboration is taking place if there is money involved or there is a resource implication.

2.22 Generating international collaborations is important for developing the reputation and expertise of this university – particularly in the case of transport

research. Collaborations in the area of medical applications seem to have arisen through “serendipitous conversations” at various meetings.

2.23 This university has a number of teaching collaborations with China: agents are not used in these as the university wants to develop long term, sustainable collaborations with trusted partners. However, every Chinese partner comes with a research agenda attached too. These partners are keen to engage with Western expertise, and also often have money to fund activities such as staff exchanges. The driver for staff to participate in such exchanges (particularly in life sciences and engineering) is a genuine curiosity in research (i.e. the reason academics are academics in the first place), plus the opportunity to have an extra pair of hands in the lab, particularly when the university has limited access to UK Research Council grants. Overseas partner institutions will also send staff to gain PhD qualifications (with funding attached), which also enables Scottish researchers to obtain extra support in the lab.

2.24 The university does have a few industrially-sponsored PhD places taken by overseas students: these tend to be funded by local companies, and “just happen to have” an overseas student associated with them. However, building on this and on the international teaching links, the aim is to establish research collaborations for the future.

2.25 There are no direct incentives offered by the less research intensive institution for staff to get involved in international collaborations. University research studentships tend to be awarded to those supervisors who can bring in an additional amount of research support. There are also a number of small pump-priming schemes for knowledge transfer within the university that invest in identified opportunities. In support of these types of activities, international collaboration would be looked upon very favourably.

2.26 For this university, subject areas of collaboration differ depending on the country – in Hong Kong these are most likely to be in science (and the life sciences in particular) and in business research. Elsewhere in China, they are most likely to be in business and engineering – areas in which jobs would have a local salary premium. According to this consultee, business research and education is important because China is developing so fast that it cannot produce enough students trained in business to meet its own needs, and having a western perspective is also important for outward-facing businesses in China today. There may be opportunities in the US around applied/development projects and consultancy, but our consultee said that it may prove too competitive an environment in research for his institution to be highly successful at present.

2.27 The funding of collaborative work also differs between countries – in Hong Kong it is most likely to be driven and funded by wealthy individuals, whilst elsewhere in China it is most likely to be driven and funded by regional government administrations.

2.28 On the reasons and motivation for collaboration, the consultee from the research institute again made a distinction between two different types of collaboration:

- *formal collaborations*: from an institutional point of view, MOUs make explicit the importance of the link to both institutions, and this is a formal, documented way of increasing the size of the science base available to both institutions, and of increasing the number of international connections. There are strong “political” motivations – they enable the institute to be seen as a serious international player
- *informal collaborations*: there are a range of motivations, not least to be part of the international scientific community and to be able to undertake research with like-minded individuals. Whilst relevant for internal promotion, it is not the key indicator, but rather one of a number of indicators that demonstrate international recognition of a researcher’s work.

### **What prior inputs and activities are required to enable the various types of international collaboration to be established?**

2.29 Required prior inputs and activities appear to vary between the different types of organisation. Important enablers for the large, research intensive universities include institution-to-institution senior level “conversations”; pro-active research base mapping and identification of notable areas of excellence; identification of what industry wants – one consultee suggested that fairly standard marketing processes are involved.

2.30 Also, an important primary consideration when establishing scientific collaborations is the quality of the science; the availability of complementary expertise; and availability of sponsors/funding. With full economic costing (FEC) now in place in UK universities, academics are required to consider more carefully the financial implications of their research collaborations.

2.31 For the less research intensive university, the enablers of collaboration mostly develop on a serendipitous basis. There tends to be a genuine keenness on both sides of a potential collaboration for things to happen, but there can be resourcing challenges: additional funding for staff exchanges would facilitate much more of this type of activity. Although funds are available for a single trip of short duration, building up successful collaboration takes extended periods of working alongside one another. PhD funding can also be used to establish collaborations.

2.32 Our consultee from this university referred to a current initiative to build links with a university in China – a research fellowship post has been created for a senior regional government administrator to attend the Scottish university’s business school. This initiative has been promoted very highly in the local press in China. The fellowship will be for one year, allowing the post holder time to embed his/herself in the Scottish university’s culture, and to obtain a “proper experience” of higher education and research in Scotland. Although not in a STEM subject area, the hope is that the publicity and links generated around this fellowship will lead to closer ties between the two institutions across a range of disciplines.

2.33 Similarly, one person in the Scottish university's business school works on Chinese economics: all publications from this work are written jointly with Chinese partners (who pay for all the research trips associated with the collaborative activity). The group in the business school has a good reputation in China that the Scottish university hopes to build on in the future.

2.34 The task of identifying appropriate lead indicators for the development of international collaborations is regarded as difficult. In countries like China, visibility is very important – “one has to be there for a long time and to be presenting something of quality”. The less research-intensive university consulted is seeking to develop teaching links first, and then hopefully research links on the back of these.

2.35 Monitoring conference attendance could be useful as a lead indicator - but usefulness may depend on the size and the quality of the conference, and bigger is not always better. The British Council may also have leads/information on levels of international engagement that could be followed up.

2.36 For the research institute, the process of developing collaborations appears slightly different from the university sector and comes about in three ways:

- the institution takes a strategic decision at the senior management/ board level regardless of existing research links
- an individual researcher is working with, or wants to work with, a researcher and considers that it would be much easier if there was a formal institutional-level agreement in place to facilitate this – some of the institute's links with China fall into this category
- groups of individuals think there is good potential for linking with a group elsewhere, either for research purposes or to undertake the exploitation of technology (again the case with one Chinese link).

2.37 In the case of the latter two categories above, these generally result from joint working (or at least contact) over 12-18 months to put the groundwork in place prior to anything formal being signed. At an individual to individual level, the prior inputs are very varied, including: contact at conferences; awareness of each others' work in the literature; previous employment/research training locations etc.

2.38 Our consultee from the NHS described a different process and culture again with regard to the most important enablers of collaboration. There is a long lead-in time to collaborations with pharma companies in particular. The best collaborations are recognised as being investigator-initiated – a Scottish researcher, possibly with international collaborators, approaching a big company with an idea. The lead time for the necessary protocol development, iterative development of the project proposal and ethics approval is normally about one year. If a study is initiated by a pharma company, lead-in time is about six months: things move more quickly because it would come with a protocol already in place.

2.39 A public-sector funded collaboration does not take much prior input, as these mostly develop on a serendipitous basis, through friends and colleagues; with those

sharing common interest; or through meeting at conferences (presenting papers at international conferences could be one measure of the likelihood of collaboration resulting from research).

2.40 Our NHS consultee noted that to develop successful collaborations, an institution (or country) needs to avail itself of the unique tools that it has, and the ability to offer something that no-one else can. For example, the patient record linkage system in Scotland means individuals can be followed for many years - one study is about to be published after following patients for 15 years, which has never been done anywhere else before. Publicising that these types of data are available should lead to an increase in international groups wanting to place studies in Scotland.

2.41 According to this consultee, getting collaborators interested requires Scotland to demonstrate (and therefore for there to be a measure of):

- evidence of having the "best brains" - e.g. through publications, conference appearances
- unique features not available anywhere else e.g. the patient records system.

2.42 Attracting international meetings to Scotland could be an important indicator here – e.g. through the Glasgow Ambassadors Programme and the tourist boards – exposing people to different aspects of Scotland whilst in the country.

**Does your institution maintain a record (a database) of international scientific collaborations: specifically, does the institution hold records of joint research publications, or of funded research and knowledge transfer projects with researchers/organisations in other countries?**

2.43 One research intensive university consulted has a research database that can be trawled for information on contracts (which would include e.g. NIH-funded projects in the USA). However, no information is captured on personal collaborations where there is no contract involved.

2.44 The university uses *ISI*, *PubMed* and other online bibliographic databases to trawl for information. This could provide the Scottish Executive with information on an institutional basis – “it is imperfect, but one way in”.

2.45 This university now have a central repository for publications, and the “centre” is encouraging academics to place information on their published work within it – “but this is a culture change that will take time to be adopted”.

2.46 However, neither the repository nor the database is set up specifically to capture information on international collaborations. These are not regarded as particularly sophisticated facilities: “the university is probably not capitalising as much as possible on what is being collected, even for marketing the university more widely and for presenting a joined-up offer. This is particularly important where industry is concerned.”

2.47 The other research intensive university consulted maintains a database of collaborations that includes data on individual academics, academic units plus some details on project partners - names of individual academics, research discipline and country.

2.48 The less research intensive university consulted holds limited information on collaborations centrally, except where a contract has been signed: its research office holds copies of all contract documentation. The latter includes university involvement in EC Framework programmes as a project co-ordinator: however the “centre” would not know if a group is involved as part of a project but is not the lead co-ordinator. Otherwise, information is “just in people’s heads”.

2.49 Universities Scotland sometimes asks institutions for information on international collaborations, including for briefings to support ministerial trips abroad, but this university has never been able to provide much data. One reason why no systematic records are held is the small scale of activity. Notwithstanding this, it is uncertain whether the effort that would be needed to collect data would be worthwhile in terms of the benefit to the university.

2.50 This university has this year invested in a digital repository of research information which will be searchable. At present, for RAE returns the “centre” has to ask individual academics about publication records.

2.51 The research institute consulted has a number of databases and files that hold relevant information:

- *files for each MOU*: this includes a set of aspirational statements around the partnership, and details the research groups involved – although the individual research groups would need to be approached for full information
- *an electronic record of staff publications*: information on joint publications with international peers could be obtained from this
- *electronic database of funded projects*: available internally and easy to search, this includes all funded research projects undertaken by staff at the institution.

2.52 Links at an individual researcher level are not formally collected or documented, although the institute’s central administration could take a stab at this as each researcher visit abroad has to have a form signed off by the Chief Executive.

2.53 The institute also holds records of delegates at the small number of conferences and meetings it hosts annually. It also holds a list of the organisations and individuals that have visited the institute – this is fairly detailed and available electronically.

2.54 The NHS University Hospital Trust consulted holds a register of all research projects as these have to have formal approval, but these records give no indication of collaborative working. No other records relevant to the present study are kept.

2.55 The NHS consultee holds the view that a publication database would be too expensive to develop and maintain. The hospital did collect these data years ago as a one-off exercise, but this proved to be very time consuming.

**If records are kept, in what form, and would you be able and willing to provide data to the Executive specifically on collaborations with USA and China? If no records are kept, what might be possible, not incurring unacceptable costs, in order to obtain measures of collaboration with China and the USA?**

2.56 One of the large research intensive universities would be willing to use the information that it has currently available, and that does not require individual academics to report additional things – i.e. being “smart” about what data it has, rather than imposing an additional reporting load.

2.57 It was suggested by the consultee that the person responsible for university travel plans may be able to identify where people are going i.e. the trips that they make.

2.58 In terms of international contacts, information on staff exchanges might be useful here. Again the case would need to be made for any additional data collection – one view received is that there is “too much data collection for data’s sake in the public sector” and the public sector “should stick to looking at real financial/economic impacts”.

2.59 Cultural engagement could be measured i.e. things related to raising a university’s profile internationally. For example, the number of exhibitions and major international conferences that the university brings to its host city.

2.60 Another research intensive university agreed that it could provide data using the university’s titled categories on research collaborations that include data on collaboration with the USA and China. While there would be no conditions for accessing such information *per se*, collaboration details involving certain partners may be confidential and this would need to be assessed prior to any data release.

2.61 The less research intensive university, as mentioned above, has recently introduced a digital repository for storing information. Publication information could be provided via the digital repository, provided this is kept up-to-date by the academic staff – “academics will only be willing to do this if there is a good reason to do so”. It was also mentioned by this consultee that EU Framework participation is searchable on the EU database of Framework projects/participants.

2.62 The research institute could release information conditional upon commercial-in-confidence agreements and the uses to which such information would be put. It would also depend on the extent of what was requested as it takes time to gather information - “the institute has no money to pay for additional staff time to spend on this”.

2.63 One consultee questions (“based on experience”) whether the Executive’s expectations are realistic around the time that would be required to pull relevant

information together. However, if a need is demonstrated, and costs were minimal, the consultee would be “neutral” about providing access.

2.63 The institute consulted has:

- *with China*: six MOU with institutions, for both research and commercial exploitation of research
- *with the US*: no formal MOUs in place, but there are individual collaborative research projects. However only a small number of these probably have associated funding, given the difficulty of obtaining funds for joint working with the US, and so only few records would be evident on the research database.

2.64 For NHS research, according to our consultee, information on publications could be obtained from *PubMed* and *Medline*. “Asking investigators is impossible” – the hospital gets less than a 25% response rate when it does a survey, so a third party survey would probably get less.

### **Other matters**

2.65 One of the research intensive universities is being pro-active in building links in the USA, forming a partnership with the University of Columbia –not in the area of STEM, but involving its business school. The focus only on STEM-related collaborations is queried.

2.66 One university acknowledged that its international office is primarily teaching-oriented at present, but that it is moving to be more strategic and to develop links with research groups across the university.

2.67 “Everyone else is going to China and the US”. According to one university consultee, when the university recently held a dinner for business leaders, they said that the university should look to the Middle East instead (particularly Saudi Arabia, Dubai and Turkey). However, the university is cautious: although there may be business opportunities in these places, it is still unsure how much opportunity there really would be for a university, except in relation to student/teaching numbers.

2.68 One consultee in a research intensive university voiced a cautionary note regarding this current project. He noted that a similar type of sector-wide database-related exercise was attempted by SHEFC (now the Scottish Funding Council), in the form of *scottishresearch.com*<sup>3</sup>: this attempt, according to our consultee, did not gain sufficient sector-wide buy-in.

2.69 One underlying problem in the current case is the absence of a standardised approach to recording and managing research data within the Scottish university sector. One university consulted uses *Info-Ed*<sup>4</sup>, some universities use the *Techtracs*<sup>5</sup>

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<sup>3</sup> [http://www.sfc.ac.uk/information/information\\_research/scottish\\_research.htm](http://www.sfc.ac.uk/information/information_research/scottish_research.htm)

<sup>4</sup> <http://www.infoed.org/>

<sup>5</sup> <http://www.knowledgesharing.com/>

knowledge sharing system, while others have developed their own programmes. Stripping out data on an ongoing basis is identified as an important resource issue, even for a large technology transfer office. One university indicated that it would seek Scottish Funding Council support for any attempt to change its existing procedures to establish a common approach to managing research data.

2.70 A fundamental issue raised by this university consultee concerns defining exactly how the data on international collaborations would be used by the Executive. There is a concern that establishing a baseline measure of scientific collaboration may lead to quantitative targets or prescriptive measures to meet government (or university corporate) needs that could be contrary to existing practices of individual academic-driven collaborative practices. The trend in Scotland towards pooling of academic expertise to compete more on the international stage may also require time for cross-institutional collaborations to be developed from which improvements or growth in research activity are expected. This may be more important than baseline measures.

2.71 Another question a university consultee posed is why the USA and China? His university derives most of its international collaboration success through the EU, due to an understanding of EU collaboration practices; broad and generous funding opportunities; and a dense network of already established academic relationships, exchanges and interactions.

2.72 Another university consultee is also wary about so much emphasis on STEM. For example, Scottish Executive needs research to underpin its own activities, and in his view much of this relates to the social sciences – economics, social effects of change, effect of Chinese economic growth on Scotland etc. Given this, why restrict interest to STEM?

2.73 In terms of the reasons for assessing collaborations, one consultee notes that financial returns are not generated from blue skies research, but from development activities. If the Executive is looking for areas of economic return through international collaboration, it should focus on the development and application of the more established technologies.

2.74 The consultee from the research institute argues that although it is to be welcomed that international science collaboration is an aspiration of the Executive, there is little clear steer on how this is meant to be achieved: there is no obvious funding mechanism, particularly for collaboration with the US.

2.75 Finally, our consultee from the NHS feels that it is important to provide the right infrastructure to make people want to come to Scotland. He argues that research groups in hospitals in Scotland are increasingly adopting a joint approach, with the NHS ‘working as one’. Universities in Scotland could do more here – pushing Scotland as a single site.

## INTERIM CONCLUSIONS

3.1 This initial research clearly demonstrates a willingness to engage in the Executive's "process", subject to time and financial resource implications, and to any commercial-in-confidence sensitivities that may arise. There is a general concern about instigating new data gathering and reporting mechanisms - anything that requires changes to existing internal "systems" - unless new resources are made available. One consultee pointed to the cautionary tale of the scottishresearch.com initiative.

3.2 Importantly, there is no evidence of any standard approach in place, even between the two research intensive universities, and certainly no common database to call on. The university with what appears to be the most developed system has it populated mostly with information on EU collaborations. The consultee from the second research intensive university recognises the value of access to better information, but as with many of our consultees there is significant scepticism over the feasibility of obtaining new information from direct approaches to individual researchers.

3.3 Data tends to be available where MOUs and contracts are involved. Where individual institutions hold publications data, the systems in place have not been designed to be searched for collaboration with particular countries.

3.4 The research institute appears to have the most comprehensive set of records, although again in terms of publications not specifically set up to be searched for collaborations with a particular country.

3.5 In expressing a willingness to co-operate in making data available, consultees have made the following caveats:

- some data may be commercial-in-confidence and therefore restricted or would be provided in an anonymous form if revealed
- a request for new data collection would be unlikely to receive support
- data requests that involved significant additional work or modification to internal systems would not be supported without a strong case being made and the appropriate resources being made available.

3.6 In short, to move to the next phase of this work it will be necessary to devise a way of working "smartly" with what each institution already has in place, supplemented by a thorough use of public domain data sources, and then to construct from what will be a quite heterogeneous set of data a "best fit" answer to the questions posed by the client in terms of collaborations with China and the USA.

3.7 There is little prospect of working towards a national, standardised approach without very significant incentives for the institutions.

## **ANNEX A: LIST OF CONSULTEES**

A.1 This first phase of the study has been exploratory. It has involved a limited expenditure of study resource to consult with a small cross-section of informed individuals in different kinds of organisations in Scotland engaging in international science collaborations:

- *Consultees:*
  - Derek Waddell, Managing Director, Edinburgh Research and Innovation (ERI), Edinburgh University's technology transfer office
  - Professor Steve Beaumont, Vice Principal Research and Enterprise, University of Glasgow
  - Professor Peter Strike, Vice Principal for Research and Knowledge Transfer, Napier University
  - Professor Peter Gregory, Chief Executive, Scottish Crop Research Institute (SCRI)
  - Professor Chris Packard, R&D Director, Glasgow University Hospitals Trust.

## **ANNEX B: PUBLIC DOMAIN SOURCES OF INFORMATION ON SCIENCE COLLABORATIONS**

This is the result of an initial trawl of public domain sources of information on international science collaborations in the UK.

### **International sources**

B.1 The *Cordis database of FP6 projects*<sup>6</sup> is searchable by activity area and by lead country. As well as a project description, individual project details include start and end dates, total funding, and a list of participating organisations by country, but whilst some of these are universities, others are listed as ‘organisation’ or ‘partnership’ for example, with no listing of the individual members within them. Searching for UK-led projects returns 679 projects.

B.2 The *Worldwide Universities Network (WUN)*<sup>7</sup> classifies itself as ‘the global research alliance’. It has seventeen university members, from Australia (Sydney), China (Nanjing, Zhejiang), the Netherlands (Utrecht), Norway (Bergen, Oslo), the UK (Bristol, Leeds, Manchester, Sheffield, Southampton, York), and the US (California, Illinois, Penn State, Washington, Wisconsin). The website includes a list of joint research activity between the members of the network<sup>8</sup>, classified by subject area, and as ‘established collaboration’, ‘developing collaboration’ or ‘grand challenge’.

### **National and regional sources**

B.3 There are various ‘shop windows’ for research expertise, technologies and business opportunities that universities in the UK have available for potential partners to view. Individual institutions often have their own list, but there are also searchable databases with information from geographical groupings of institutions. Some examples are:

- Interface<sup>9</sup>: central access point to the Scottish research base
- University-technology.com<sup>10</sup>: database of technology opportunities from Scottish universities
- i10<sup>11</sup>: contains an expertise database and list of technology opportunities for the universities in the East of England

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<sup>6</sup> [cordis.europa.eu/fp6/projects.htm](http://cordis.europa.eu/fp6/projects.htm)

<sup>7</sup> [www.wun.ac.uk](http://www.wun.ac.uk)

<sup>8</sup> [www.wun.ac.uk/download.php?file=1426\\_ResearchActivityMapMay2006.pdf&mimetype=application/pdf&type=attachment](http://www.wun.ac.uk/download.php?file=1426_ResearchActivityMapMay2006.pdf&mimetype=application/pdf&type=attachment)

<sup>9</sup> [www.interface-online.org.uk](http://www.interface-online.org.uk)

<sup>10</sup> [www.university-technology.com](http://www.university-technology.com)

<sup>11</sup> [www.i10.org.uk](http://www.i10.org.uk)

B.4 Although the above web-sites contain case-studies of ‘successful’ collaborations, there is no searchable database indicating how the opportunities or any partnerships have progressed. There is no indication of comprehensiveness.

B.5 The EPSRC and the National Natural Science Foundation of China have sponsored the *UK-China Research Network on automation, computing and manufacturing*<sup>12</sup>. The network has the following aims:

- to share and disseminate new concepts, theories, methodologies, technologies and tools within the member organisations and with wider academic and industrial sectors in both the UK and China
- to identify areas of research and development that will be of interest to academia and industry in both the UK and China and to support further collaboration
- to increase the capability of the participating organisations and more generally the wider research communities of both the UK and China in awareness and understanding of intelligent automation, computing and manufacturing and improve research quality in these areas
- to help participating UK universities establish joint research programmes with partner universities in China and achieve international academic excellence in the proposed areas.

B.6 Eighteen UK universities are founding members of the network, including the University of Glasgow. It also includes 32 Chinese universities and research institutes. There is some information on joint meetings and conferences on the website, but no information on outputs from the Network so far.

B.7 The *UK-India Education and Research Initiative*<sup>13</sup> was launched in early 2006, with a main part of its mission to stimulate research and education collaborations between the two countries. It aims to deliver 50 new collaborative research programmes by 2011: initial applications were due before mid-September 2006. At the time of writing the winning bids have not been announced.

### **Individual institutions**

B.8 Individual institutions list or make available information on international collaborations in different ways (where they do so at all). In addition to news or PR items detailing a single new collaboration or one that has just generated an output, the following are examples of the types of information available:

- the website of the International Office of the University of Bristol contains a page listing the institution’s current international collaborations<sup>14</sup> by

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<sup>12</sup> <http://82.23.131.119/UKChinaNetwork/default.htm>

<sup>13</sup> [www.ukieri.org/higher-education.htm](http://www.ukieri.org/higher-education.htm)

<sup>14</sup> [www.bris.ac.uk/internationalcentre/collaboration](http://www.bris.ac.uk/internationalcentre/collaboration)

country, institution/university and relevant department within Bristol. The site also contains scanned copies of MOUs in the majority of cases. Most of these are concerned with student exchanges and study abroad programmes, but others are more specific. For example, the agreement with the Faculty of Science of Kaselsart University, Bangkok, aims 'to promote scientific and educational cooperation and academic exchange between the two institutions in Chemistry and related disciplines'. However, the web-site contains no information on the outputs of any of the listed collaborations

- on the postgraduate section of the *Napier University*<sup>15</sup> website is a list of institutes, organisations and companies with which the University has collaborates. However, there is no indication as to the extent of these collaborations, their outputs, or whether they are current or completed
- the *University of Glasgow* has recently established a new Collaborations Unit within the University senate<sup>16</sup>; there is a link to a list of existing academic collaborations, but most (all?) of those listed appear to be teaching-related collaborations, such as joint delivery of masters programmes.

B.9 Given the variability in the detail on these websites, extracting any meaningful information from individual websites would appear to be problematic and likely to yield only limited value: an approach to each university would be required to obtain a fuller picture with all the difficulties described earlier in this report.

B.10 There are also specific large-scale collaborative initiatives involving UK universities, e.g. the Cambridge MIT Institute (CMI)<sup>17</sup>, a joint institute of Cambridge University and MIT. CMI is currently setting up 'Knowledge Integration Communities': these will focus on new research areas, and on enhancing knowledge transfer between academia and industry. Each of these will involve a cross-CMI team, so will be international from the outset.

### **Other sources**

B.11 Overseas fellowship programmes include those highlighted in the table below. A more extensive list of the main international fellowship schemes operated by UK funders can be found at: <http://www.dti.gov.uk/files/file30064.pdf> pp148-149.

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<sup>15</sup> [www.napier.ac.uk/postgraduate/default.asp?w=3&x=1](http://www.napier.ac.uk/postgraduate/default.asp?w=3&x=1)

<sup>16</sup> [senate.gla.ac.uk/qa/collab/index.html](http://senate.gla.ac.uk/qa/collab/index.html)

<sup>17</sup> [www.cambridge-mit.org/cgi-bin/default.pl](http://www.cambridge-mit.org/cgi-bin/default.pl)

<b>Funding body</b>	<b>Scheme</b>
Leverhulme Trust	Study Abroad Fellowships <sup>18</sup> Visiting Fellowships
EPSRC & Toshiba	Toshiba Fellowship Programme <sup>19</sup> : offers European scientists working in a UK HEI or Government Institution the opportunity to join one of Toshiba's research teams in Japan for up to two years
The Royal Society	International Joint Projects <sup>20</sup> : mobility grants for projects involving a UK team and collaborator outside the UK

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<sup>18</sup> [www.leverhulme.ac.uk/grants\\_awards/grants/study\\_abroad\\_fellowships/](http://www.leverhulme.ac.uk/grants_awards/grants/study_abroad_fellowships/)

<sup>19</sup> [www.toshiba-europe.com/eur/fellowship/](http://www.toshiba-europe.com/eur/fellowship/)

<sup>20</sup> [www.royalsoc.ac.uk/funding.asp?id=2344](http://www.royalsoc.ac.uk/funding.asp?id=2344)