SECONDMENT – LESSONS FROM PRACTICE

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EXECUTIVE SUMMARY

This note summarises an exploration of practices in staff exchange between Cambridge University and its industrial partners. Based on a series of about 40 interviews, it identifies different ways of working and keys to success. The work was performed with support from the EPSRC Impact Acceleration Account.

'Secondment', viewed most generally as an exchange of people outside of formal progress review meetings, is a powerful support mechanism for effective knowledge and technology transfer (KTT) between academia and industry. In its broadest sense, from true long-term secondments down to visits of, say, two weeks, secondment is widely used across the University already, though most people reserve the phrase for staff embedded for three months or longer. The value of staff exchange is well-understood.

Staff exchange is at its most valuable enabling the transfer of implicit knowledge between research collaborators, typically focused on an agreed agenda, domain or problem. However, everybody sees staff exchange and, especially, true secondments as a source of that most valuable of outcomes from collaborative research; the serendipitous discovery that opens up new directions and opportunities. In general, the longer the stay, the greater is the emphasis on and the expectation of value that will be broader than the core collaborative project or topic.

Because of Cambridge's emphasis on longer-term research and because of the desire to encounter these new opportunities, in general there is little attention paid to tight quantification of the value for money (VfM) of secondments. This is particularly true of work done with research-rich companies, championed at senior level within the company. Only loose assessment of VfM is seen as a key to success, preventing a slide into a transaction that resembles contract R&D. Most of those involved assess a secondment by whether it provides access to capability, data, relationships or broader opportunities and does so in a way that could not obviously be replicated faster and more cheaply. Satisfied it does, decision-makers view secondment as a strategic investment and do not further quantify its VfM.

Secondment, *per se*, requires considerable trust and management between the parties. In an instance where secondment is at the core of a research group's strategy the lead academic spends considerable time establishing and managing the relationships. In the vast majority of cases, using staff embedded for more than a few weeks, the secondment occurs in the context of a mature relationship. Stays of a few weeks and allocations of, say, a day per week are common, best positioned as a mechanism for transfer of results and today not generally labelled as 'secondment'.

Good secondments display a few key characteristics and supportive practices:

- Senior championship, on both sides, with mutually understood objectives and a willingness to invest time maintaining the relationship in the deep-seated belief that secondment delivers benefits beyond the short-term project
- Skilled middle management that support the secondment in practice, creating a supportive culture and balancing the short- and long-term deliverables
- Shared understanding between academia and industry of how both can expect to benefit and how both prefer to work
- An umbrella governance structure, complete but not intrusive, covering IP, confidentiality and funding
- Clear objectives, usually documented, but only informal metrics that drive constructive behaviour
- Minimal focus on short-term value or on explicit assessment of value-for-money
- An 'orientation' path for the secondee, explicitly planned or arising from mutual experience and a supportive culture
- Defined and specific tasks, but with space (and maybe an explicit plan) for broader benefits to be realised

Successful secondees are characterised by their social skills and adaptability in working across two very different environments, often in ambiguous roles, and needing to be able to quickly demonstrate their competence and value.

1. INTRODUCTION AND BACKGROUND

This document describes the findings from a brief programme of work to explore effective practices in secondment between Cambridge University and its industrial partners. It aims to provide guidance to people setting up and managing secondment activities.

People with experience of championing, hosting, and managing secondment, together with secondees themselves, were interviewed and the insights are assembled here. A brief literature search confirmed and extended the findings, but the vast majority of the literature is concerned with secondment for continuing professional or career development, hence less relevant in this context.

This work focused on secondment as a route to knowledge and technology transfer (KTT). There is some overlap with secondment as a means to career development and for development of researchers' skills. The Roberts' Review[1] drafted the agenda in this respect and has led to considerable subsequent debate, but this is less relevant to KTT and is not further addressed here.

Furthermore, and unsurprisingly, many of the findings reported here align well with good practice in establishing and managing any constructive relationships between industry and academia where people share experience and insight, via secondment or otherwise.

This document addresses the following different aspects of secondment

- Secondment definition, positioning and models
- Aims, objectives and benefits reported
- Governance, monitoring and funding
- Practices to maximise effectiveness
- Characteristics of the successful secondee

The Appendix includes a set of case studies prepared by the journalist Becky Allen on behalf of the EPSRC Impact Acceleration Account, covering the activities of some who contributed through the interviews that underpin this report.

2. SECONDMENT DEFINITION, POSITIONING AND MODELS

- Be flexible with terminology – the 'secondment' label can be unhelpful
- Use a variety of secondment models designed according to the objectives sought and the nature of the knowledge to be transferred
- Carefully managed, secondment can be a primary route to building knowledge and technology transfer relationships, but more generally secondment should be considered in the context of more mature relationships

[1] http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/documents/enterprise_and_productivity/research_and_enterprise/ent_res_roberts.cfm

2.1 Be flexible with terminology – the 'secondment' label can be unhelpful

Secondment is, in the eyes of many in the University and corporates, viewed as an extended stay, typically for 3 months or longer, virtually full-time, where the secondee is working alongside the host's staff, effectively a member of their team. Buried within this concept lies a number of variations that can be designed and managed to make 'secondment' more effective as a means of knowledge and technology transfer (KTT). There is value in maintaining some ambiguity in use of the term to allow such variations to be used constructively.

Secondment also has a flavour of personal and professional development for the secondee, indeed, in many instances this is the primary purpose and knowledge transfer may not be mentioned. Hence for some, using the label 'secondment' can impose a presumed purpose of training, which can be seen as unhelpful.

The 'secondment' label can also be unhelpful in the face of a company's perception that good people are too valuable to lose for long periods of time, expressed as "if we can do without you for six months then we can do without you altogether". Knowledge transfer labelled as secondment can also attract the attention of institutional HR departments that, although well-meaning, are perceived as a source of delay, formality and bureaucracy that is almost always unhelpful. This perception comes from both academic and industrial sides.

Many company-funded fellowships allow academics the opportunity to spend considerable time working in the collaborating company, but few regard this as a 'secondment', and many dislike the label, seeing the time spent with partners as just part of the job.

Other labels bring their own connotations, for example, 'internship' causes confusion with the practice of unpaid placements as a route to employment, or as the domain of the inexperienced, needing considerable coaching and management. Internship is also often related to students. 'Visiting scientists' may work as a label in science-led companies but not in corporate cultures that favour pragmatism and engineering over rigour and pure science.

Conversely, it is well understood that if knowledge transfer is the objective, then secondment is one tool among many and all those consulted were very happy to negotiate the label and the activity itself to optimise the outcome.

2.2 Use a variety of secondment models designed according to the objectives sought and the nature of the knowledge to be transferred

One classification of secondment activities is by primary purpose and hence direction of secondment

1. Industry acquiring capability and tacit knowledge (inbound to CU)
2. Industry obtaining access to non-core skills and facilities
3. Both parties understanding context to better target research (inbound to and outbound from CU)
4. Both parties understanding and identifying applications of joint research (inbound to and outbound from CU)
5. Imparting explicit knowledge, tools or problem solution (inbound to or outbound from CU, or KTP[2])

Everybody reports deriving many benefits from secondment, so each of these primary purposes is accompanied by many others – but the primary purpose does much to define the priorities and hence the design of the secondment.

The nature and character of the secondment also depends fundamentally on the nature of the knowledge / technology to be transferred. If the knowledge sought is primarily tacit then there is considerable value from extended periods of secondment, into or out of the university. Longer term secondment is also characteristic of large companies for whom exchanging tacit knowledge is equivalent to building capability and for whom secondment is an accepted investment, the value of which is recognised but impossible to quantify.

[2] Knowledge Transfer Partnership: www.ktponline.org.uk

The embedded corporate laboratory is a special case of the first model above. Typically the company sets up a secondment programme for their staff to visit Cambridge and work alongside academics. Students get formal exposure to the corporate research environment through planned visits.

An important part of ensuring that research remains relevant to corporate partners is sharing the details of the context into which the research must fit, explaining trade-offs and compromises and communicating the cost and value structures that help academics to choose better research directions. One approach is to second academics to work with company teams, so absorbing tacit knowledge of the commercial world. The insights acquired then enable the researchers to better help their corporate partner with short-term problems as well.

In an alternative instance, a research group may have developed capabilities and insights, believed by a corporate partner to be interesting and valuable, but wider opportunities for application are still unclear. In this case a secondee works within the corporate partner to explore where the research might be most useful. The same activity helps the Cambridge research group to prioritise and to position its research to be of specific attractiveness and value to its partner.

By contrast with tacit knowledge transfer, when the knowledge is codified or embodied, for example in a tool or a technique, then 'secondment' of a different kind is valuable. Here it is best achieved with secondment periods measured in weeks or, at most, months. The most successful instances are related to projects where the value of the project has already been established in the eyes of the corporate partner and the investment in staff time is one component of the cost of the project. In this case, valuable KTT is occurring but the 'secondment' label becomes unhelpful. The 'outbound from CU' model is used by many groups as PhDs or postdocs visit industrial partners to 'hand-over' project results. The KTP is a special case in that an 'Associate', the secondee, is specifically employed to pursue a tightly constrained task with the focused intention of addressing a commercial problem or opportunity.

Interestingly, many of the subsidiary benefits of secondment (see the next section) are realised within each of these models, primarily due to enlightened management of the secondment itself. Mechanisms such as providing time outside of the project task to allow people to participate in wider activities enable the creation of wider contacts and the serendipitous discoveries that are the hallmarks of the most successful KTT.

2.3 Carefully managed, secondment can be a primary route to building KTT relationships, but more generally secondment should be considered in the context of more mature relationships.

Secondment can be used to build new KTT relationships, but this is fundamentally dependent upon the willingness and skills of the leading academic to manage closely the creation of the relationship with the corporate, the selection of the secondee and the management of the programme. Given the considerable effort required to do this well, secondment can be at the core of a research group's engagement with industry only if it is an explicit strategy. The lead academic must spend significant time and effort in relationship management, maintaining alignment and addressing cultural transitions of the people involved.

In the majority of cases, however, secondment of durations of greater than, say, three months is a valuable tool in a relationship between an academic group and an industrial partner that has matured over time, typically a few years. This is because successful longer-term secondment requires shared values, mutually understood objectives and a degree of trust between the parties. The trust is vital because secondment entails greater ambiguity and a greater level of commitment from each of the host and home organisations and the secondee. Although relationship and secondee management remains important, the context and history of the relationship provides a little more forgiveness for misstep or error.

Successful secondment requires mutually understood stances on intellectual property rights (IPR) and confidentiality and this either requires up-front management or, more often, a period to establish trust, custom and practice. In the best cases there are multiple parallel relationships between Cambridge and the corporate and these all support the secondment activity, but building those parallel channels takes time.

3. AIMS, OBJECTIVES AND BENEFITS REPORTED

Benefits for companies include:

- Acquiring and assimilating new capabilities
- Acquiring access to non-core capabilities and facilities
- Solving specific problems
- Access to 'different' thinking
- Building a broader network of contacts
- Foresight about new technologies and new directions
- Staying close to the 'state of the art'
- Benchmarking their own capabilities
- Providing career options
- The kudos of being seen to work with Cambridge
- Serendipitous contacts, discoveries and new directions

Benefits for academics include:

- Understanding the context for their research, leading to more usefully applicable research
- Access to real data
- Providing impact examples
- Broadening the range of contacts
- Broadening the number of researchers involved
- Reducing the workload in relationship maintenance
- Linking to juniors who may eventually rise to positions of influence.
- Enabling salary top-ups that makes recruitment of researchers easier

3.1 EACH CASE IS DIFFERENT, MOST HAVE AN OVERARCHING AIM, BUT ALL SEEK SECONDARY BENEFITS AS WELL - AND EVERYBODY VALUES SERENDIPITY

Although the aims of secondment can be typically aligned with one of the models described in the previous section (capability development, understanding context, finding applications or problem solving), without exception people report multiple benefits from any secondment. Especially from the more experienced, the opportunity for an unexpected, serendipitous discovery of a new direction is seen as the greatest value from a secondment. Such valuable opportunities arise often enough to justify a degree of faith in an essentially unquantifiable benefit stream.

COMPANIES report seeking the following benefits from secondment of their staff into the University:

- Acquiring and assimilating new capabilities, especially those of long-term and strategic significance
- Acquiring access to capabilities and facilities that are useful but not needed as a core corporate competence
- Access to 'different' thinking (more formally analytic, more systemic, more novel)
- Building a broader network of contacts, typically to access new insights and new capabilities, especially those that might open up new strategic options
- Foresight about new technologies and new directions well in advance of their commercial impact
- Staying close to the 'state of the art' to ensure agility in capability
- Benchmarking their own capabilities against the leading edge
- Providing career options for staff

Companies value secondments into their organisation for all of the reasons above – but also see such secondments as an extended in-depth 'job interview' for the individual. The secondees sometimes mirror this as they assess the corporate environment into which they step.

Smaller companies focus more on the solution of specific issues or the answering of specific questions, whereas larger companies see secondment as more a strategic tool than tactical. Smaller companies report lacking the resources to acquire capabilities well in advance of their immediate application to the business, a comment confirmed in the literature[3].

ACADEMICS see the following benefits from secondment to industry

- Understanding the richer and deeper context for their research, so leading to more usefully applicable research – described as "Seeing the 'why' of the research". (See also Figure Three later in this report)
- Access to real data that would be unavailable otherwise, either because it is primarily of research interest and hence would not be collected by the company or because confidentiality issues would make it otherwise inaccessible
- Providing impact examples, motivated by recent exposure to the demands of the Research Excellence Framework
- Broadening the range of contacts and hence research opportunities for their group (there is no incentive to help other academic groups, aside from altruism)
- Broadening the number of researchers involved, especially enabling the more reticent members of the research group to build relationships with corporate partners
- Broadening the base of people involved in maintaining the relationship (and reducing the workload for seniors in this)
- Forming links with juniors who may later rise through the company to positions of influence.
- Broadening the skills and experience of the individual seconded member of the research group
- Enabling salary top-ups that makes recruitment of researchers easier

For **INDUSTRIAL SECONDEES**, the assignment is often a deliberate career choice to broaden their options, to explore new horizons or to differentiate themselves within their company for their future career. The success inside the company of a previous secondee sends powerful signals about the value for individuals' career prospects.

ACADEMIC SECONDEES quote many of the benefits noted above, but articulated in more personal terms. In some instances, a secondment helps them to make a career choice between academia and industry. Some mentioned the advantages of having two mentors of usefully different perspectives, building their transferable skills and developing a broader network of personal contacts likely to be useful in future.

Interviewees mentioned many of these benefits, but each secondment has different objectives, each in the context of an industry-company relationship seeking specific objectives and the relationship vary over time. Each case is 'special'.

[3] Wright, A., *et al*, "Mid-range universities' linkages with industry: Knowledge types and the role of intermediaries", Research Policy 37 (2008) 1205–1223

4. GOVERNANCE, MONITORING AND FUNDING

Common clear messages emerge:

- Ensure senior championship, on both sides, in order to extract best value for both parties
- Middle management skills are essential to make secondment work in practice
- An umbrella governance structure is essential, but should fade into the background in day-to-day operations
- Clear objectives and informal metrics drive the most constructive behaviours
- Funding for a strategic relationship is seldom contentious – but tactical issues tend to be a source of difficulty

4.1 ENSURE SENIOR CHAMPIONSHIP, ON BOTH SIDES, IN ORDER TO EXTRACT BEST VALUE FOR ALL PARTIES

Corporate senior championship is essential, especially for extended secondments. This provides the corporate patience that allows the natural dynamics of both research and the collaborative relationship to emerge. Perhaps more importantly, it allows 'qualitative' assessment (and defence) of value within the company, avoids short-termism and prevents bickering over metrics. Furthermore, it is primarily the seniors in the company who manage long-term research that understand that the unexpected outcomes are often the most valuable.

Senior championship is also important to provide a bit of 'slack' in the system. Allowing people space around their projects to make the wider contacts, to explore new avenues and, sometimes, to explore the apparently irrelevant is the key to enabling the serendipity that so many value.

Such corporate champions are either a senior with a strategic perspective on their research agenda or a senior with an academic background who understands academia and its dynamic.

Academic senior championship is also essential. The work required to maintain a secondment relationship with a company does not deliver short-term results, indeed it can seem a distraction. Furthermore, senior academics report having to push junior colleagues to leave their comfort zone and the delights of Cambridge in order to achieve the breakthroughs that secondment sometimes enables. There is a school of thought that maintains that most academics simply don't understand the value of the deep insights into commercial reality until after they've completed a secondment.

Key to success is mutual trust[4], signified by senior champion buy-in and alignment, often based on personal relationships.

So important is this point that some academics whose groups have many secondees will not agree to a new secondment until they have met with senior staff in the industrial organisation to ensure commitment and to negotiate aligned objectives that are mutually shared. Only then will they discuss the details of the programme. Similarly, care needs to be taken that outbound secondees will be working in a supportive environment with senior support in the company in order to achieve the best knowledge transfer and also to protect the best interests of the secondee. Before trust is established, use management attention and structured process.

[4] A study of the "Drivers and Barriers in European University Business Co-operation" revealed trust as the greatest driver for success. *'The State of European University-Business Cooperation. Final Report - Study on the cooperation between Higher Education Institutions and public and private organisations in Europe, ISBN: 978-92-79-23167-4* http://ub-cooperation.eu/pdf/driversbarriers.pdf

4.2 Middle Management skills are essential to make secondment work in practice

Even with senior championship in place, the middle management within the company needs to skilfully manage secondments in either direction. The best managers are often people who have conducted university research or have been secondees themselves. Many are graduates of the research groups with whom they now collaborate.

The middle managers and company scientists need to know how to integrate the technology that is being transferred, in some instances performing the translation of capability to corporate problems. The most successful deliver the short-term wins that make the relationship valuable in the eyes of commercial business units. A key part of the researcher's job is to provide middle management with evidence to 'sell' the value and the success of a programme. Secondment makes it easier to understand the key criteria of and the appropriate language for the target audience.

Skilled corporate middle managers also know how to tailor the key messages about progress for different stakeholders; their senior management, academic partners, or funding agencies. They also often mentor the secondee.

Mid-career academics need also to be attuned to the subtleties of managing the relationship and delivering quick wins while pursuing long-term research. Some senior academics actively develop these skills within others in their research teams as part of their team's core capability, culture and values. Others keep relationship management to themselves, seeing it as a source of competitive advantage within academia.

4.3 An umbrella governance structure is essential – but should fade into the background in day-to-day operations

Having a robust governance structure in the background is important, but it is important that it not be intrusive. If the secondment can be conducted under the auspices of prior governance structures this makes starting easier, otherwise it becomes important to begin preparation early – especially if legal teams need to be involved.

Seek umbrella IP and confidentiality agreements that do not need frequent refinement or renegotiation. Different academics have very different stances on these matters and this can define the operating freedoms available. Beware new collaborations under mature relationships, because new academic collaborators may wish to adopt a different stance with regard to IP and confidentiality. Generally this can be managed, but does have the potential to cause a company to revisit the whole basis of its relationship with the University.

The existence of a non-disclosure agreement of some form is essential and is a key enabler for secondees, opening up conversations and allowing free flow of information. Similarly, it is a useful 'badge of acceptance' if secondees can obtain security ID, an email address and a phone number within their host organisation. These attributes signal institutional approval of the visitor.

Greater geographic distances seem naturally to entail more formality, if only because of the cost of travel and the opportunity cost that drives people to carefully plan meetings, often of many participants. Proximity allows for frequent and informal contact and eases co-operative working.

Beware a 'formal system' of secondment unless institutional functions, such as HR, are aligned and pragmatically supportive. Otherwise they can create well-meaning but nonetheless effective blocks and barriers. Even if these blocks and barriers lie only in the perceptions of the negotiating parties they are nonetheless obstacles to collaboration.

To make reporting meaningful, limit it to topics (and metrics) that will be discussed in face-to-face meetings. This makes the effort of production worthwhile and provides a basis for communication. Reporting content which is not discussed is likely to be a residue of bureaucracy.

The question of authority in setting tasks seems primarily a topic debated in the abstract. Most people describe resolving priorities by straightforward and constructive negotiation.

4.4 Clear objectives and informal metrics drive the most constructive behaviours

All successful secondments take place in the context of clear objectives, often with both long-term and a short-term components. Documenting agreed objectives is important, both for clarity and as a reference point for interim and final reviews.

However, tight and quantitative metrics are hard to manage. Embedded laboratories use the measures of success of their company, such as papers published, conference presentations given, patents, press releases etc.

In most instances it is understood what motivates the partners and the secondee and people informally measure the success of the secondment against these motivators. Timescales of measurement are also important. Secondees need a grace period before results start to flow and success depends upon the company understanding this. This also needs to be considered in assessing the success of a secondment; a short secondment contains a relatively larger proportion of learning curve, so may well be proportionately less productive than a longer secondment.

A few people have developed their own very informal, but nonetheless useful measures of success, for example:

- Is one later invited back for formal or social events?
- How easy is it for a senior to 'just drop in'?
- Is the scope of conversation rewardingly both broad and deep?
- Can we see a greater range of contacts emerging?

By contrast with this rather loose approach to evaluation, tightly applied Management by Objectives in companies can drive short-term behaviours from company staff which may clash with the needs of an evolving relationship or the timescales of research.

Obtaining performance feedback from hosts about secondees is difficult. In general hosts are 'polite' and will avoid negative feedback. Positive feedback can be equally disruptive if the secondee endeavours to use favourable feedback to secure a higher salary, a more senior position or a job with another company. Some hosts are categorical that they will not provide written feedback.

4.5 Funding for a strategic relationship is seldom contentious – but tactical issues tend to be a source of difficulty

In most instances, funding is less important to corporates than the time required of their staff. This is particularly true when a senior champion is responsible for the budgets and sees the investment as strategic.

However, middle management in companies often focus on their scarce resources, typically on the time of their key people, especially when the timescales of return differ from the timescales over which they are measured.

Furthermore, some organisations focus on short-term funding issues driven by annual or even quarterly budgets. This is often true of the 'Business Units' as distinct from the 'Research Groups' of large corporates. It is even more of an issue in companies where time is measured explicitly, for example consultancies across construction and other engineering sectors and subject to what one interviewee called 'the tyranny of the timesheet'. In these instances funding of secondment can be very difficult.

Many departments allow considerable freedom to their academics to manage costing as they see best. By contrast, the Computer Laboratory publishes its policy for all to see (www.cl.cam.ac.uk/local/arrivals/hosts/).

Perceptions of 'fairness' of costs is important. Secondees can feel aggrieved when they have to pay long-distance transport costs personally. Companies sometimes perceive 'bench fees' as disproportionate to the physical resources they will access

in the university. Academics worry whether they are delivering value for money and wonder about trading off early income for longer-term returns from research funding from a valued partner.

An accessible budget that covers travel and makes *ad hoc* meetings easy clearly signals an intention to make the relationship work. In other instances, academics package costs for projects or for posts in ways that fit corporate budget processes and expectations, for example bundling 'bench fees' in with other costs.

Some academics run projects that depend upon staff exchanges to ensure the transfer of technology. By emphasizing the effective transfer of a capability as the valuable outcome of collaborative research so staff transfers become a means to an end. Costs of the secondment embedded within the project become just part of the overall proposition.

5. PRACTICES TO MAXIMISE EFFECTIVENESS

Some common clear messages emerge about good practice:

- Invest time, continuously, in managing the relationship
- Create an 'orientation' phase for the secondee
- Set specific tasks, but leave space for broader benefits to be realised
- Arrange time allocation to help the secondee manage communications and their career
- Understand and disseminate how short-term problem solving can lead to good long-term research
- Provide cultural support for secondments

5.1 INVEST TIME, CONTINUOUSLY, IN MANAGING THE RELATIONSHIP

Secondment represents an investment of an individual's career as well as money and management time and to make it effective it must take place in the context of a supportive environment at both the 'home' and the 'host' institutions. Especially if a secondment is beginning, the management of the host institution needs to invest time and effort ensuring that there is a governance framework in place and effective processes to maximise the value of the secondment. Even for mature relationships, considerable investment of management time is the hallmark of success.

This includes timely reviews of progress, opening doors for wider contacts and relationships, continuing management of expectations of a range of stakeholders, together with management of the research groups within which the secondment is embedded. Successful secondment managers all emphasized the importance of the time spent – apparently for little tangible return, but nonetheless found to be essential for a smooth secondment.

Short secondments from industry also need management, with frequent reviews to ensure the project is on course and that benefit is being realised. In a short secondment there is no time to recover from an error in research direction or activity so more review is needed, not less.

Welcoming company visitors and secondees and ensuring that they derive personal benefit and observe corporate benefits from collaborative research is a key part of nurturing people who return to their company as advocates for Cambridge.

As KTT becomes more effective, University management attention must turn to addressing the concerns of other stakeholders, most notably, fears of exploitation (e.g. of a 'one-way flow of ideas and insights') and attention must be given to maintaining an open atmosphere in which academic freedom of discussion remains unfettered.

Proximity helps – while at greater geographic distance or across different cultures the need for investment of time becomes even greater. Where a secondment relationship decays, observers report it sliding into either 'contract research' of increasing formality or simply into abeyance where the secondee spends more and more time in their home environment.

It cannot be assumed that a new relationship, for example with a different research group in the University or with a different part of a company, will carry over the social capital from any prior relationships – so these will need explicit management and yet more investment.

5.2 Create an orientation phase for the secondee

Successful secondments are characterised by a phase during which the secondee learns the host's environment. Often, in mature relationships, this is implicit rather than explicit if, for example, the secondee has worked on joint research teams before, has become familiar with the objectives and research agenda in place and understands the prevailing IP and confidentiality practices.

However, for new relationships this orientation phase needs to be explicit. For example, the governance framework needs to be created and the secondee needs to be briefed. For subjects such as IP and confidentiality this briefing needs to go beyond the letter of the agreement and is usefully illustrated by examples drawn from custom and practice. An explicit agreement of objectives ensures alignment, and documenting objectives provides a reference for future reviews.

Mentoring of the secondee in this orientation phase ensures that they focus effectively and maximises the chance of the 'quick wins' that will cement their credibility and hence the support of both host and home for the secondment plan. Those companies that have a 'project mindset' seem to particularly appreciate attentive management for their secondees.

Informal and effective mentoring can be provided by the manager of the University research group, and some report seeing this as their duty to ensure success. Formal in-company mentoring seems to be rare, most probably because it has not been sought. Wise secondees seek advice from a variety of sources in the host organisation about research topics and priorities, power structures, cultural norms and social aspects.

Typically, mentoring of secondees is needed to

- Understand the governance structure and rules, especially in practice and application
- Define the short-term / long-term outcomes sought and, especially, to define useful short-term projects
- Access the host organisation's internal networks (e.g. communities of practice, project teams, research groups)
- Help with socialising (if needed) through either formal or informal support

Social contact between the secondee and the host team depends on contextual factors such as the age and family commitments of the secondee, the sociability of the secondee, the age profile of the host team, and the wider social context, e.g. college environments. Good host teams unobtrusively provide many opportunities for social contact (e.g. parties and events) along with broader professional opportunities (e.g. explicit invitations to seminars) to engage the visitor to the extent that they feel comfortable.

5.3 Set specific tasks, but leave space for broader benefits to be realised

Those experienced in managing secondments aim to achieve a balance between targeted outcomes with quick wins and enabling new multi-disciplinary contacts that open up new avenues. The most concise description was "Something to do but not too much".

The task should encourage engagement with the host group and should not be research that the secondee could have done as easily in their home environment.

Sometimes the first task can be useful as an implicit test, to demonstrate skill sets and to allow the host to assess the risk of involving the secondee in core and important projects or with other important stakeholders (e.g. senior management in an industrial partner).

It is important to allow enough time for the secondee to make the broader links and to explore the new avenues that are so valuable. Advice and, better still, introductions across the host organisation are very helpful here. Companies seeking wider capabilities speak of prioritising their relationships with university research groups that are good at this.

For secondees to Cambridge, crafting a formal programme that encompasses both the target project and a programme of wider meetings, visits and networking assures the company of explicit management of the secondment, supports the secondee and maintains an air of professionalism that some companies particularly value.

5.4 Arrange time allocation to help the secondee manage communications and their career

If geography and logistics allow, it is useful for the secondee to spend predictably regular bocks of time within both their host and their home environments.

For a secondee immersed in a host environment, spending about a day per week in their home laboratory seems to enable better communications, transfers more information faster, and keeps the secondee 'in the loop' at home. This last aspect addresses the frequent concern of secondees that their career will suffer if they cease to be visible in their home environment. This allocation of time also eases the impact on the personal and social life of the secondee.

Some secondees report that having defined days of the week (or month) in their home laboratory actually increases communications because their colleagues seek them out on the days they are available. Furthermore, having a defined calendar system prevents the insidious creep of day's spent doing 'the home job' that then grow in number, especially when driven by commercial pressures or a boss who is less sympathetic to the secondment.

For assignments that are of lower intensity, for example when the person is spending one day per week at the host then a different danger emerges. Sometimes these people find it hard to manage their workload because their home environment expects 'business as usual' while their host expects progress on the assigned task. Unless this is addressed explicitly, researchers run a real risk of being considerably overloaded during the secondment. Academics seconded out must consider their college obligations as well as their department obligations – it is easy to overlook the sum of commitments.

In very practical terms, some companies and research groups that run frequent intern programmes create public domain resources to support this orientation phase and to brief people joining them.

5.5 UNDERSTAND AND DISSEMINATE HOW SHORT-TERM PROBLEM SOLVING CAN LEAD TO GOOD LONG-TERM RESEARCH

Some academics embrace secondment as a route to identifying interesting and applicable research. Others fear it is just 'commercial problem solving' and could corrupt the purity of their academic endeavour. Discussion with those of the former camp leads to the model described in the following diagrams.

Figure One, below, represents a typical starting point. A company perceives they face a problem, within the context of their industry sector, market and history, and they seek out some university research capability. Alternatively, a company might seek out a capability in the expectation that, within their context, this capability will be useful to address future problems (or opportunities). In other instances, an academic with a capability finds industrial partners who may value that capability as a means to solve their problems. Work begins.

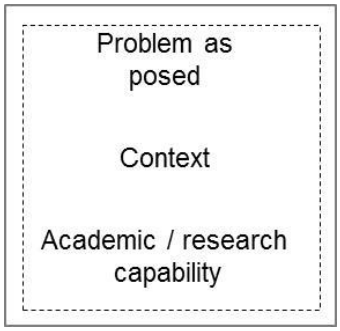

Figure One: Capability meets problem

Figure Two, below, represents the short term solution of the problem as posed. This is the Knowledge Transfer Partnership model where a capability is brought to bear on an issue and that capability is transferred to the company to solve the problem. Secondment has a vital role to play in this situation because the academic builds a deeper understanding of context, either by spending time immersed in the company's environment or via the company sending secondees to the university to impart the tacit knowledge of what trade-offs are acceptable and how to choose an adequate solution. It is here that the 'quick wins' build the academic's credibility and underpin a continuing relationship, maybe encouraging further research funding.

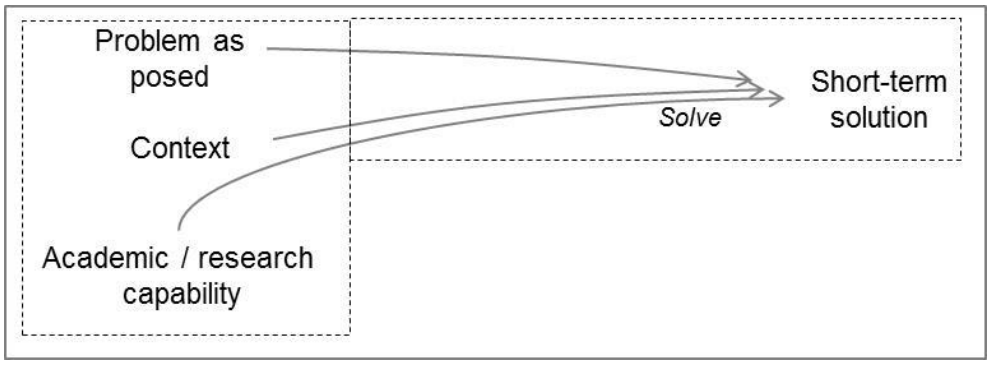

Figure Two Capability, moderated by a deep understanding of context provides a better short-term solution to a problem

The next step, shown in Figure Three, is where the true value of research is realised. The skilful academic, now armed with a deep understanding of the problem, plus their discipline skills, and funded to look further then explores and reframes the problem in a more generic and 'interesting' form.

The successful investigation of this more general problem leads to results worthy of publication, enhances the academic's and the company's capabilities and then is applied to the company's issues at a more generic and often more valuable level. Sometimes the intellectual property or the capability generated has independent value in its own right.

Figure Four, describes a simplified example of this process in practice between the Whittle Laboratory and Rolls Royce. Note that this diagram and description is an outsiders' interpretation of a subtle interplay between different researchers and the industrial collaborator, of evolving thinking and multiple influences – but the prime intention is to provide an accessible example of the value of secondment in enhancing research:

1a. Rolls Royce has a continuing interest in optimizing the design and manufacture of the compressor blades in their aero engines.

1b Researchers at the Whittle Laboratory in Cambridge have built up a large body of experience, tools and competence in the design of the internal aerodynamics of aero engine compressors blades and stages, including the design of leading edge profiles

1c Rolls Royce operate within the context of their design processes and tools and their manufacturing processes

2a Professor Rob Miller's visits and sabbaticals explored (among other things) the implications of manufacturing capability and tolerances, especially on the context of Rolls Royce processes

2b Dr Martin Goodhand pursued a secondment to implement new analysis methods within the context of Rolls Royce design practice.

3 Identifying a broader issue and reframing it as a research domain, Dr Goodhand and Professor Miller explored the pressure profiles at the leading edge of compressor blades under laminar flow conditions and the implications of both manufacturing compromises and engine deterioration. Their paper "Compressor Leading Edge Spikes: A New Performance Criterion" appeared in the Journal of Turbomachinery[5].

4 Work continued in this promising area, leading to them winning an ASME best paper award in 2011[6] for their paper "The Impact of Real Geometries on Three-Dimensional Separations in Compressors"[7]

5 Meanwhile, for Rolls Royce the implications are considerable, because a few percent enhancement in specific fuel consumption represents a significant competitive impact – and the benefits were pursued immediately by a rolling programme of engine upgrades.[8]

[5] http://turbomachinery.asmedigitalcollection.asme.org/article.aspx?articleid=1468374
[6] http://www.eng.cam.ac.uk/news/stories/2011/Prize_Whittle_Lab/
[7] http://turbomachinery.asmedigitalcollection.asme.org/article.aspx?articleid=1468714
[8] Norris, G. J. (2008), "Rolling enhancement: Rolls delivers upgraded Trent 700 to Airbus as three-way A330 market battle intensifies" *Aviation Week*, 8th December 2008 pg. 42 (Note that the timings are influenced by commercial considerations and academic publication schedules)

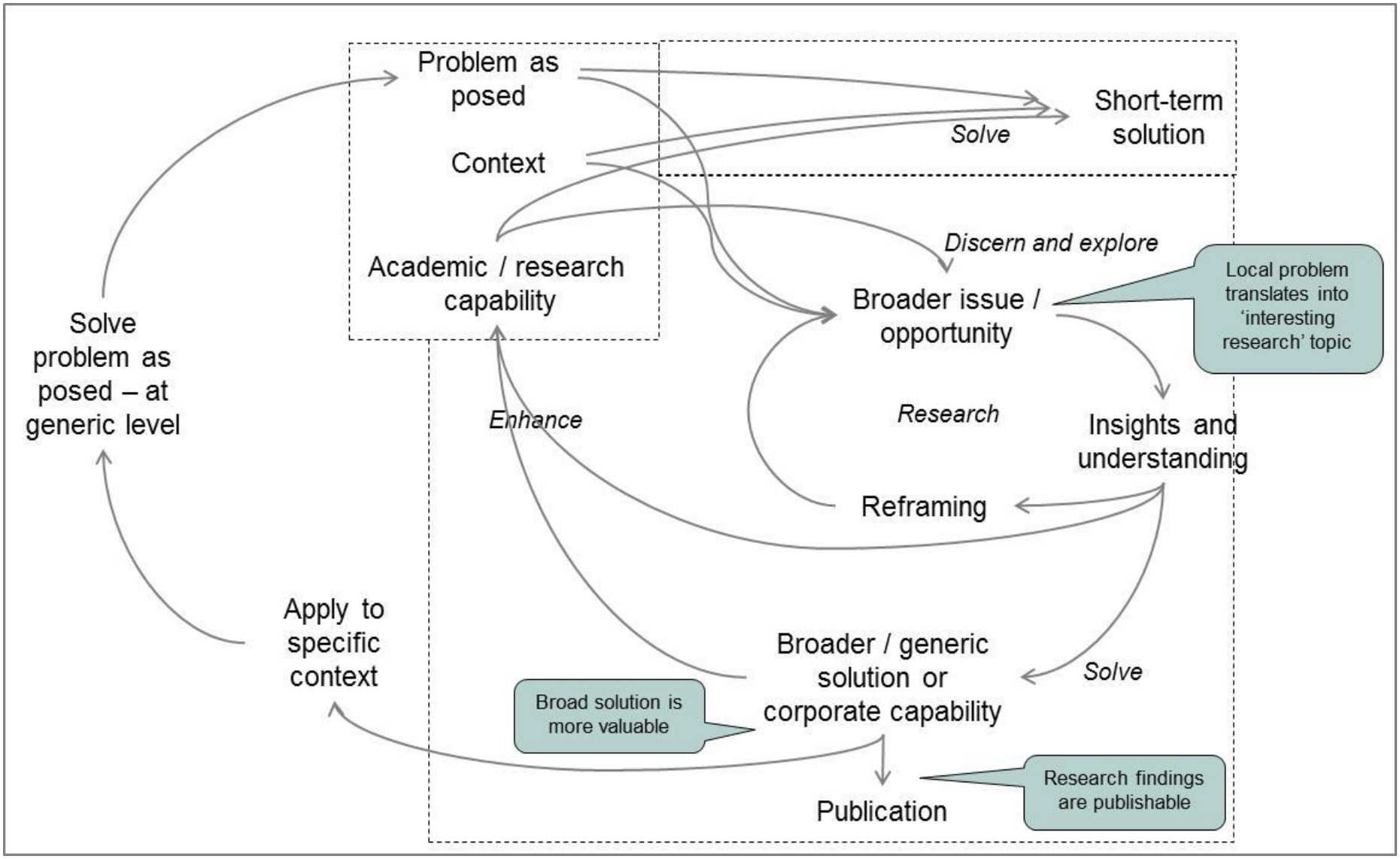

Figure Three: A local problem is reframed into an interesting research topic and as the topic is addressed, capability is enhanced and fundamental results are created

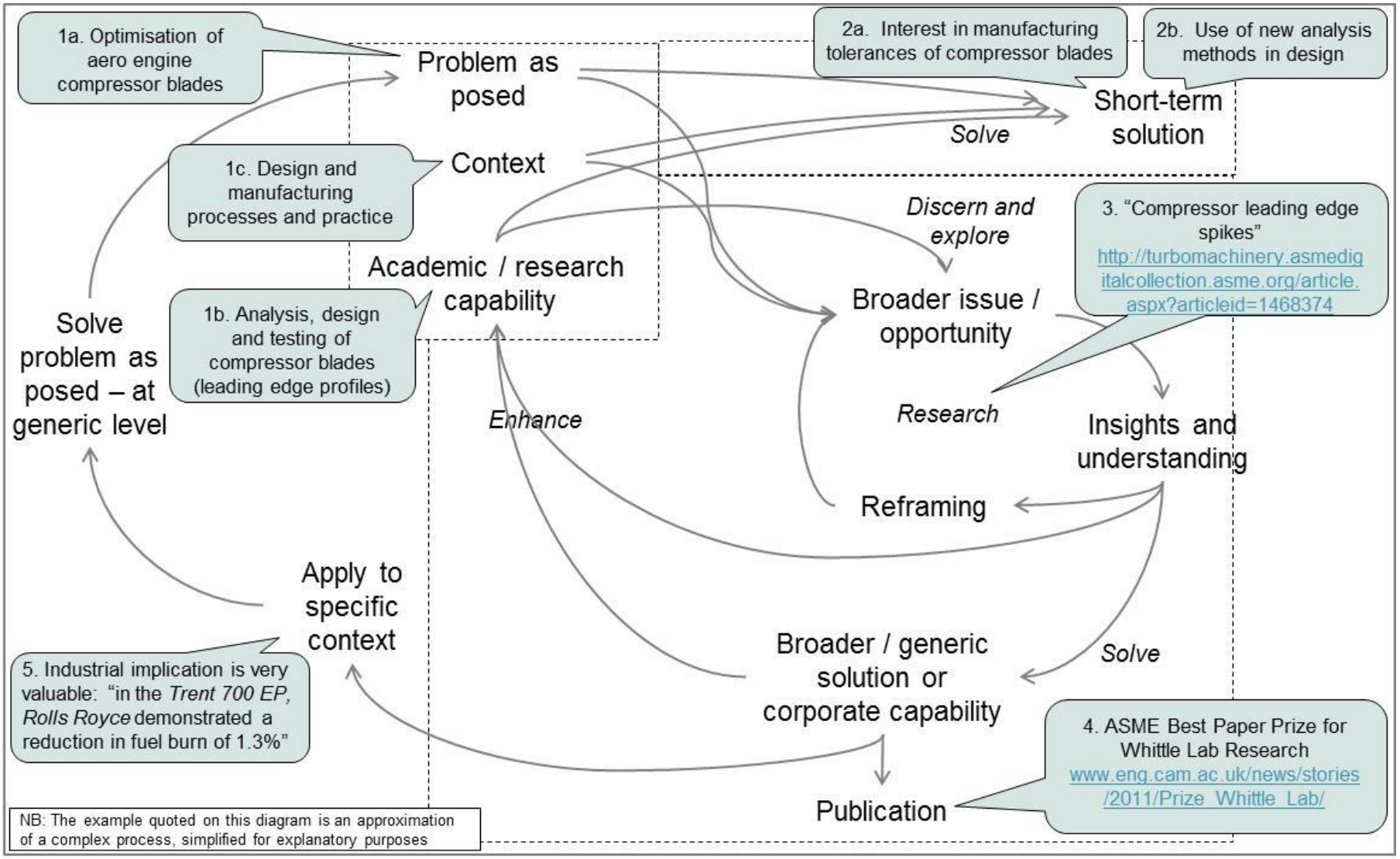

Figure Four: A simplified explanatory example of research and industrial performance enhanced by secondment

Secondment is important to this process for the following reasons:

- Often it is the context that shifts the problem from trivial to interesting – and understanding that context at a visceral level takes time
- Sometimes the context opens up profoundly new routes to solution – routes that are not visible to the outsider
- Sometimes secondment allows access to valuable company data which is vital to understand, reframe and research the problem
- Secondment brings more perspectives and disciplines to bear on the issue
- Secondment allows the targeting of solutions to the most valuable opportunities or problems and thus enables future research funding that is seen by the company as a worthwhile investment

But to those academics who have never embraced secondment, this process is not understood and the value of secondment is not evident.

5.6 PROVIDE CULTURAL SUPPORT FOR SECONDMENT

The best secondment environments are characterised by actions that emphasise the significance of secondment and the importance of secondees. Establishing visible role models whose success has been helped by secondment is important. So, for example, research group newsletters might always feature the successes of secondees, while presentations and introductory documents will emphasise the significance of members of the team who are on or have been on secondment. Companies will use 'profiles' of their secondees in describing their research activities. It then becomes clear to secondees that their credibility is enhanced in the eyes of their peers and seniors. These simple but significant actions implicitly signal that secondment is important and that secondees are viewed in a particularly favourable light.

6. THE SUCCESSFUL SECONDEE

Key characteristics of the successful secondee are, in priority order:

- Social sensitivity and maturity, coupled with the ability to operate effectively in a new environment, and in two different environments simultaneously
- An ability to thrive under ambiguity, especially in instances where theirs might be the first secondment
- Intelligence and a basic competence in their discipline is an advantage in delivering 'quick wins' or in persuading the host organisation that the secondee is a useful member of the team and can add value to adjacent projects.
- Time management skills to deliver both on their core project and also access wider opportunities

The choice of secondee is important – more than money is at stake.

Companies are very conscious that their staff member, seconded to Cambridge, represents the company, its ethics, values and culture. With Cambridge students often targeted for recruitment, companies are very aware that their secondees have a role to play in making the company appear as attractive as possible. Hence company secondees are unlikely to be either the 'unmanageable mavericks' or the 'superannuated has-beens' feared by some academics.

Similarly, companies are aware that secondees visiting them may well be candidate recruits and so make special efforts to welcome them and engage positively.

Those academics who see secondment as core to the activity of their research groups espouse the same values and same thoughtful selection and support of secondees to make their transition as easy as possible. This is particularly true for secondees from other nations.

The secondee may be taking a risk with their career in accepting the secondment and may have little prior visibility of the task or the culture into which they will be expected to enter, hence their resilience is important.

Some companies filter out employee candidates for secondment who they believe may be seeking an 'escape to academia' from the commercial pressures of industry. Employees cynical about the value of academia are also not chosen.

Recruiting new people specifically to be secondees, as may happen in the Knowledge Transfer Partnership programme, is particularly risky because one is recruiting an unknown individual for a situation that is, by its nature, unpredictable. It is also more logistically complex if they are being co-recruited by the University and the company.

Timing is important; PhD and postdocs (and their supervisors) are reluctant to undertake secondments in the latter stages of their grants. There is also a danger in sending PhD students too early, for example before they have built a foundation of competence that allows them to be useful to the company during the secondment. Secondment into Cambridge should be timed to coincide with the beginning of the academic year. As well as the social fluidity that makes engagement easier there are many more orientation events at that time for the influx of new arrivals.

Because secondees are immersing themselves in a new environment and are tasked with establishing lines of communication between two potentially different worlds they need to display considerable social sensitivity and maturity. Often, they will be the first to have transferred between the collaborators, so many of the issues they face will be new. Sometimes, the solutions to the problems they encounter will be created on the fly. When time-consuming decisions are to be made, for example about a policy stance, the secondee needs to be able to continue effectively while the situation remains unclear. Their presence may highlight political differences within factions of the host organisation. They need the social skills to recognise and then navigate such issues

Secondees often have to win over doubters in the host organisation. There will be questions about the secondee's competence and ability to add value. Sometimes host staff will feel they are disadvantaged by the secondment scheme. Hence the secondee needs to be competent and able to perform well, not only in their core task but also demonstrably in adjacent topics and projects.

It is easy for the secondee to fall into one of two traps; to focus only on the niche that is their project or to spread their attention too thinly and so deliver nothing. The skilled secondee manages to deliver both on their core project and also access wider opportunities for their organisation.

Charles Boulton would like to thank the EPSRC IAA for supporting this work and all the interviewees who were so helpful in providing time, insight and advice throughout.

APPENDIX: CASE STUDIES

Dr Andy York, Johnson Matthey

"The main benefit of the collaboration is access to equipment plus the expertise that goes with it. It's this combination that counts" - Dr Andy York, Johnson Matthey

As Johnson Matthey renews its collaboration with the Department of Chemical Engineering and Biotechnology for a second five-year term, Dr Andy York explains what long-term secondment is like, and how staff, students and industry all benefit.

Since 2008, speciality chemicals company Johnson Matthey has built a close and effective working relationship with the Department of Chemical Engineering and Biotechnology. Seconded to oversee the project, Dr Andy York of Johnson Matthey says the relationship – built around a shared interest in catalysis – has worked well for both the business and the University.

At a time when Johnson Matthey is thriving and regards research as vital to its future, it has provided £500,000 towards the Department's new building project, as well as £50,000 per annum for studentships and postdoctoral researchers or, as York describes it, "for doing interesting things".

Having seen the project evolve over the past five years, York says the University benefits in other ways: "They also get access to real materials. I often see papers on perfect systems, which, when we try to apply to ourselves in the real world, don't work. So bringing real samples here adds to the research."

York's presence in the Department, where he supervises students and gives a small number of lectures, is a useful conduit between students and a potential employer. "My posting has been an advertisement for the company," he says. "It allows Cambridge chemical engineering students to find out more about Johnson Matthey, which in the past wasn't a well-known employer of chemical engineers."

The project also provides both parties with an effective way of sharing expertise and equipment. "The main benefit of the collaboration is access to equipment plus the expertise that goes with it. For example, we both have equipment for making catalysts, but Johnson Matthey has greater expertise in making catalysts. And Cambridge has NMR and MRI equipment and the expertise for studying these catalysts, so it's this combination that counts," York says.

And working with industry gives academics an inside line on industry concerns, keeping the University up-to-date with the challenges the industry faces, which in turn feeds into fundamental research.

For York, the secondment has been an opportunity to gain new skills as well as an enviable network. "This role has taught me new skills, not just technical but supervisory, soft skills, and given me access to a huge number of people," he says. "Johnson Matthey holds an annual conference for all its students and their supervisors, at which they like to seat people at tables where they don't know other

guests, but for me, they couldn't find a table with people I didn't know! So it's been a fantastic networking opportunity."

Only one area of the secondment, says York, needs improving, and that's the challenge associated with housing long-term secondees and affording them access to the college system that is such a key part of the Cambridge community.

"The biggest challenge for me was my life beyond the Department. Being in Cambridge for much of the week for several years, the plan was to buy a house here. But my arrival coincided with the dip in the housing market, so instead I rented a room in a shared house. It was like being a student again, which for someone in their 40s was not ideal. If the job hadn't been so interesting, it's not something I would have done for more than a few months, never mind years," he says.

Lack of college life is also limiting, he believes: "One of the challenges is to get the University to recognise someone like me, who despite bringing the Department £1.5m, has no college affiliation. With so many links made in colleges, there should be more recognition, or fellowship opportunities, for example. That was the biggest challenge."

Department of Chemical Engineering and Biotechnology www.ceb.cam.ac.uk

Johnson Matthey www.matthey.com

Dr Gary Tustin, Schlumberger

"What I really liked was being free to stand back and just look at science for its own sake. It reaffirmed my love of going into the lab" - Dr Gary Tustin, Schlumberger

Apart from having to swap a superb workplace canteen for Subway sandwiches, Dr Gary Tustin, scientific adviser at Schlumberger, can't think of a single down side to the year he spent seconded to the University of Cambridge's Department of Chemistry.

"It's the best university in the world, and to be given that opportunity – it was too good to turn down. There was no down side," he says. So, having worked for Schlumberger in Cambridge for the past 17 years, when in 2012 Tustin was given the chance to spend 12 months in Dr Oren Scherman's group in the Melville Laboratory for Polymer Synthesis, he jumped at it.

He says that at the outset all three parties – Scherman, Schlumberger and Tustin himself – kept an open mind about what the secondment might achieve. Building a long-term relationship with the University, benchmarking the business against academia, and breaking old habits were all on the agenda, but so too was making space to let unexpected things happen.

“I was fairly open-minded about it, which I think was one of the good things,” he explains. “My managers at Schlumberger were very flexible about what they wanted. And while Dr Scherman was very good about hosting my secondment and giving me lab space as well as an office, I was also free to interact with other academics, finding out what they did and how Schlumberger might be able to cooperate with them on future research projects.”

Making contacts and building a long-term relationship between the University and Schlumberger has, Tustin says, worked well. Now back at Schlumberger, his diary is evidence that links between the company and the Department of Chemistry are being sustained.

Pointing at a box on his desk, he says: “That was brought up here last week by someone at the Melville, for a project we're doing together. We're funding a project with Dr Andrew Wheatley, so I see him regularly, and the head of department came here this week to give a talk on molecular dynamics and see how we can move things forward there. This has all come from my secondment.”

Like all good secondments, the benefits flow both ways. For the Department of Chemistry, the secondment has paved the way to sharing equipment – the University taking advantage of Schlumberger's XPS, and the company is gaining access to solid-state NMR – as well as raising the profile of Schlumberger among staff and students.

“Although we have a large chemistry-based business, Schlumberger's name is not that well known within chemistry, so it's nice for more people to know we exist and consider us for future employment,” says Tustin. “And the secondment allowed me to see what high-level graduates are like, which is useful for our recruitment process.”

Tustin too benefited significantly from the secondment. “I gained an awful lot, not only in learning and experience, but also enjoyment,” he says. “What I really liked was being free to stand back and just look at science for its own sake. It reaffirmed my love of going into the lab. After my year in Chemistry I really knew that I wanted to spend my working life involved in day-to-day lab work.”

As well as the welcome he received from the Department of Chemistry, Schlumberger's support and the fact that, because Tustin already lived in Cambridge, there was minimal disruption to his family life were key elements in the secondment's success. “It meant I didn't have to have to uproot my family, or be away from them during the week,” he says. “I imagine that a year somewhere else, far from home, would be very different.”

Schlumberger, he adds, was fantastic. “I came back for scientific advisory review meetings every few weeks, so I was able to maintain contact that way, but I was able to hand over everything, so I arrived in Chemistry with a clean slate,” Tustin explains. “It was handled very well, for which I'm truly grateful, because I know other people at other firms who've ended up doing the two jobs in parallel, which makes it impossible to immerse yourself in your secondment.”

Back at Schlumberger, Tustin says he wouldn't hesitate to recommend secondment to others. “Even though I had to eat Subway sandwiches, and it was weird going to the pub with 23 year-olds – who do

lots of discussing of their projects over a pint – it was lovely to be in that environment again," he says. "I got much more out of it than I thought I would. I got a whole load of interesting new ways of looking at, and doing, things. We all develop habits, and it's only by being in a new environment that you learn there may be better ways of doing some things."

Schlumberger www.slb.com

Melville Laboratory for Polymer Synthesis www.melville.ch.cam.ac.uk

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Professor Rob Miller, Whittle Laboratory, Department of Engineering

"New thinking comes from seeing the world differently. Because they provide windows into other people's way of seeing things, secondments are gold dust" - Professor Rob Miller, Whittle Laboratory

Professor Rob Miller, who has oscillated between Cambridge's ivory towers and the coal face at Rolls-Royce throughout his career, says that as well as generating some of the best science, listening to industry can help change the world.

Since 1973 the Whittle Laboratory, where Professor Miller works, has been one of the world's leading turbomachinery research laboratories. Invented by former Cambridge student Charles Parsons in 1884, the steam turbine still generates more than three-quarters of the world's electricity, and the jet engine, invented another ex-Cambridge student, Frank Whittle, is responsible for powering all the world's large civil aircraft.

"It's rare that you get one technology which lasts such a long time, and if we can make even tiny improvements in its efficiency then worldwide it's worth hundreds of millions of dollars of fuel burn per year," Miller explains.

It's not surprising that for such an applied science, time spent in industry as a means of cementing links with industry is crucial to Miller's success and the success of the Whittle Laboratory, which receives two-thirds of its funding from industry.

What might surprise other academics, however, is that Miller's close ties with the likes of Rolls-Royce not only drives improvements in a global technology, but also yields some of the best and most exciting research in the field.

According to Miller: "A lot of people say you either choose to do proper, fundamental research or you do industry applicable research. My experience has been that many of the best research questions – the ones that win the international academic awards – often come from industry. They are the real problems in engineering."

Since arriving in Cambridge in 2001, Miller has spent extended periods working with different areas of Rolls-Royce's business. More than ten years on, this regular cycling between academe and industry has led to new areas of work, PhD projects, award-winning papers and major collaborations with other universities including MIT.

The collaborations stem from the relationships and reputation Miller has built up at Rolls-Royce over many years. “If I'd not been there and listened to their problems, gone out for beers with them, become friends with them, none of that would have happened. I'd have ploughed on with my existing research and wouldn't have thought out of the box,” he explains. “And if you can be the person who takes one of their problems and solves it for them then that reinforces it, they'll bring you the next problem and the next. It's a virtuous circle.”

Time spent in industry has taught him the value of getting outside the Cambridge bubble. “Being in different worlds is so important; new thinking always comes from seeing the world differently and because they provide windows into other people's way of seeing things, secondments are gold dust,” says Miller.

Most people, however, do not do this. “Because of the opportunity that Cambridge offers for world class research and the pressure of administration and teaching, many academics do not find the time to undertake secondments in industry,” he argues. “We encourage, and provide opportunities for undergraduate engineers to spend summers working in industry but often fail to do the same for academics.”

The final turn of the virtuous circle is the impact secondments can have on translating technology back into industry. Bridging that gap is almost impossible without industry champions, Miller says.

“Labs like the Whittle are brilliant at getting inspiration from industrial collaboration, but still struggle to translate those ideas into real products. Secondments give us advocates inside a company, and it's when they grab the idea and pull it kicking and screaming into the real world that our research makes a difference.”

Professor Rob Miller www.eng.cam.ac.uk/profiles/rjm76

Professor Steve Ley, Department of Chemistry

"Secondments to our group don't just come to work for a year, they become friends and – if you've done the job well – they will be your ambassadors" – Professor Steve Ley, Department of Chemistry

Since arriving in Cambridge almost 25 years ago, Professor Steve Ley has thrown open the doors of the Department of Chemistry to dozens of secondees from around the world. Done right, they add "sparkle" to his group and show that sharing can reap rich rewards.

"Lots of my colleagues say 'Steve, you're crazy, it will only cause you hassle'. They believe that they deliver the best science by being focussed, and that secondments are often a distraction," says Professor Steve Ley.

Over the past 20 years, Ley has welcomed dozens of secondees to the Department of Chemistry, and believes that far from being a distraction, they enrich his group and embody the essence of what it means to be an academic.

"Cambridge is full of wonderful people: incredibly bright and able and successful at getting grants, but that really comfortable feeling with industry isn't there yet," he says. "A university is a house of learning and knowledge, and if starts to lock up its ideas and intellectual property it isn't a university any more. It has to engage with the spirit of training, learning, interaction and transfer of knowledge – in both directions. It's about sharing, and the ability to share to get more back is the principle I work to."

As a scientist daily immersed in data, Ley admits that although the benefits of secondments can be difficult to measure, they can be far reaching and long lasting. "Direct returns are hard to quantify. You can quantify the funding, but what you can't quantify is that ethereal benefit – people respecting our work and being first choice partners when programmes come up. You never know how the returns will come, but they can be big hits," he explains. "Secondments to our group don't just come to work for a year, they become friends, contacts, and if you've done the job well, they will be your ambassadors."

So while paperwork and processes matter, Ley's focus is firmly on building long-term relationships through secondments. "It's not about quick wins, I'm interested in doing this because I'm scientifically engaged and looking to create a relationship that will be longer lasting and two directional," he says.

Secondments are also valuable for Ley's students, many of whom will end up working not in academia, but in industry: "I've got a big group, 40 people from 12 countries and I like the cosmopolitan spirit of the place. People gain a worldliness through these interactions and students need this."

It's not all been plain sailing, however, and Ley is keen to pass on what he's learned from failures. "The things that didn't work are not appreciating personal issues, and that can be a real problem. The other is letting a project drift, thinking it's fine and not having mechanisms in place that force formal discussion. A year can pass very quickly," he says.

His advice on the paperwork is to keep it simple. “The important thing is not to over bureaucratise things; keeping it simple and lean is crucial,” says Ley. “Goals should always be clearly defined on paper, but one page is enough. Likewise, regular reporting is important but overdoing it is unproductive.” This ensures projects are flexible enough to evolve and change, which is often where the “sparkle” that comes from that makes the best secondments shine.

And although some secondments may not require it, good pastoral care is an essential safety net. “They are with us for a year, they’ve stepped into the unknown and there will be personal baggage – leaving family or being into a new environment, adapting to new work patterns – they might struggle with,” Ley says. “So I like to make sure they’re happy, and that the family is OK, new schools and accommodation are working. You need to put some effort into the personal things to make these programmes work really well.”

The Ley Group, Department of Chemistry www.leygroup.ch.cam.ac.uk

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Dr Liz Curmi, Department of Engineering

“Academics want papers published, but you also want your work to be used, that’s why secondments are so important” – Dr Liz Curmi, Department of Engineering

Most researchers want their work applied. For Dr Liz Curmi of the Department of Engineering, being seconded to BP's group technology team means a new tool developed at Cambridge could find new, real world applications.

Seconded for 25% of her time to BP, Dr Liz Curmi of the Department of Engineering is finding out first-hand the differences between a world-class university and a global business. “One of the benefits for me of the secondment is learning about how a corporation works. Academia is very different. The first time I walked into BP's massive offices at Sunbury I felt a bit over-awed,” she says.

Her brief is flexible, the aim of the secondment being to find out which parts of BP might benefit from using a new tool Curmi and her group in Cambridge developed. Known as Foreseer, the tool – whose development was funded by BP – is a novel, and highly visual way, of representing flows of natural resources and the connections between them.

“We are a group of researchers working on natural resources – energy, water, land and their effects on greenhouse gas emissions – and the connections between them. The tool allows us to visualise the supply and demand of these resources for different users, such as industry, households, agriculture, and the effect and trade-offs between these resources under different scenarios, for example increasing the supply of water through desalination would also increase the demand for energy. It

allows policy makers, governments, industry and even investors to understand the impact of alternative policies and scenarios on these resources," Curmi explains.

Impressed by the methodology, BP wanted to see where and how it could be used in the business, regionally, at site level but also strategically.

Compared to university life, Curmi is finding corporate culture very different. "The biggest challenge compared with academia is that when industry takes a decision, they want it acted on there and then. Academics want to justify every number, every fact, so that's quite an adjustment."

Balancing the demands of BP with those of research is also challenging, she says: "Some weeks I find I'm doing two jobs, doing too much, or that I've not done enough research, so it's a balancing act which I am still finding the right level for."

In common with many secondments, building relationships and making contacts is key for Curmi, but for her it's also crucial to the project's success. "I'm on site to meet people," she explains. "I can show the model to lots of people, but they need to be the right people, the people who will buy into it and the people who make the decisions, and in large corporations it's not easy to find the right people, which is why the direction of BP group technology in this regard is so important."

The benefits, though, are significant. She's already building different skills to those she's gained from academia, especially on how best to present her work to an industrial audience: "Academics are very interested in every detail, whereas industry is often most interested in the big picture. I'm learning that the more simply I can describe my research, the better it's understood. You need to focus on their concerns, get to know what they're interested in." She has the opportunity to promote her research to a wider audience, including the World Future Energy Summit in Abu Dhabi where she presented the Foreseer tool, alongside the BP team, to government representatives and other interested regional stakeholders.

There are benefits too at a university level, because of BP's interest in fostering collaborations between different universities. "It gives us a way of talking to other universities they are funding, which helps develop collaborations," she adds.

If, as the relationship matures, the Foreseer tool becomes widely used within BP, that will be the most significant benefit of all, Curmi believes. "Whether you're a geographer studying irrigation water in farms or a mathematician doing fluid dynamics, every researcher wants their research to be applied. Academics want papers published, but you also want to take something forward and get it used – that's why secondments are so important."

Foreseer project www.foreseer.group.cam.ac.uk

Testing the Water, *Research Horizons*, www.cam.ac.uk/research/features/testing-the-water

Dr Nikos Nikiforakis, Laboratory for Scientific Computing

"Working alongside industrial colleagues rubs off: that's why we've never had a student who didn't get a job months before they finished here"- Dr Nikos Nikiforakis, Laboratory for Scientific Computing

From BP and Boeing to Orica Mining Services and Schulmberger, Dr Nikos Nikiforakis regularly welcomes industrial colleagues to his group in the Cavendish Laboratory. And while he doesn't categorise them as secondments, the relationships he has built with industry over many years have helped shape his group's fortunes.

"They are not traditional secondments," Nikiforakis explains. "They are much more variable, flexible arrangements." They have been so successful, however, that not only does almost all the group's funding come from industry (funding that over the past five years has topped £5m), their approach is now embedded in the University's new Maxwell Centre.

For a group focused on scientific computing and numerical methods, the benefits of working closely with industry are many fold, says Nikiforakis. His students benefit from close contact with the real world, and when it comes to knowledge exchange, there's no substitute for having industry staff physically embedded in the group.

"The companies we work with send staff here several times a year for extended periods," he says. "During that time they don't just have casual discussions, they work with students to get the knowledge out. That gives everyone a deeper understanding of the deliverable – for example a mathematical model for enhanced oil recovery for Schlumberger – than they'd ever get through a paper exercise."

And because his students learn first-hand what it takes to work with industry, they gain skills that give them a vital edge on entering the labour market.

"When my students leave the group, they compare very favourably with those who have only ever done academic work. Because our students are all funded by industry, they have to be professional, writing reports and presenting. Working alongside industrial colleagues rubs off, and it comes across at interview," says Nikiforakis. "That's why in all the years I've been doing this, we've never had a student who didn't get a job months before they finished here."

While he admits that there is a balance to be struck between delivering for industry and meeting Cambridge's academic standards, he believes that in his field, industry is the source of some of the most challenging research questions.

According to Nikiforakis: "They bring us the hot problems – that's one of the big benefits of our relationships with industry – but also the serious, fundamental science problems, so it's a win-win. The most important thing for us is to be doing science that fits into the welfare of society, and keeping these contacts gives us a reality check, day-in, day-out."

The success of this approach he measures in repeat business. "It's about self-perpetuation and sustainability," he explains. "Our reputation means we work by word of mouth. The industrial partners see first-hand that the system works, so they are willing to invest again."

The group will soon move to the new Maxwell Centre, set to open in 2015. Building on the innovative activity currently supported by the Winton Programme for the Physics of Sustainability at the

Cavendish Laboratory, the centre will be the vehicle for translating ‘blue skies’ research into products of importance for the industrial sector.

“The move to the new Maxwell Centre will significantly enhance the industrial activity of the group. Its offices and meeting rooms have been designed specially to ensure that industry and academics mix, and to accommodate industrial colleagues for extended periods of time. The whole conversation with the architects was about how to build this ethos into the design, so our group's experience of working alongside industry contributed significantly.”

Laboratory for Scientific Computing www.lsc.phy.cam.ac.uk/directory/nikiforakis

Maxwell Centre http://www.cam.ac.uk/research/news/new-centre-will-bring-together-frontier-physics-research-and-the-needs-of-industry