A Spectrum of Academic-Industrial Interaction:

Developing Mechanisms for the Mutual Benefit of Academia and Industry to Grow UK PLC

The Wakeham "Review of UK Physics" (2008) identified that physics in the UK is very strong but more needs to be done to encourage university-based physicists to work better with industry. Interestingly, they found that much research in physics of particular interest to industry is conducted by engineering departments. Nonetheless, whether physicist in physics or engineering departments, more mechanisms need to be developed and utilised for better interaction to exploit ideas and innovation.

The aim here is, in a few words, to highlight the role of the individual academic and introduce some of the mechanisms that could (or arguably should) be explored to exploit potential possibilities with industry.

The academic at a typical research-intensive university has three aspects to their role as "academic" to varying degree. The first and most time consuming is research – knowledge creation – which is often measured by the quality and quantity of publications. The second aspect is generally what is considered a university is all about, i.e. teaching or knowledge transfer. This teaching encompasses a wide range of activities including undergraduate, postgraduate and short courses as a means of dissemination of knowledge. The final aspect of the academic's role has been increasing in importance in recent years, i.e. enterprise or knowledge exploitation, or more specifically wealth creation. Any research project at a university is increasingly needing to justify itself fully in term of "impact" at the social and economic level of exploitation. Whether that is good or bad is another debate but these three aspects of the academic's role can overlap to generate a beneficial economic "impact" when involving industry.

The academic potentially has many opportunities to interact with industry. If you are an academic, think for example about how many undergraduate projects could have a direct input from a local company? How many PhD students do you have where one of their outcomes might be of interest to an industrial partner? Do you have a research assistant/fellow who could be partly funded by industry to exploit your research or teaching?

If you are an industrialist, you might not see at first glance how an academic might benefit you. However, do you have a small project that needs investigating in the next year or so but no time or staff to look at it? An academic may be able to help. Are you

aware of the different funding mechanisms which could off-set some of your research and development costs particularly when involving a university?

From my own involvement, an example of an academic-industrial interaction at a lower level, or bronze level as classified in the Table, gave a company several benefits. They needed a characterisation study conducted on electronic component terminals under harsh operating conditions and had minimal resources. They gained this characterisation study and the university gained an industrial relevant undergraduate project. Moreover, the main benefit for both parties is the start of a relationship for future more substantial collaborations.

The bronze level of interaction is a good starting point to explore whether there is a mutual interest between the academic and the industrialist. There is minimal risk for both parties. Other mechanisms could include MSc project students as well as inter-ships or a short consultancy project, all with a view to a more substantial interaction.

An example of a medium level of interaction, or silver level, is an EPSRC CASE PhD studentship (Engineering and Physical Sciences Research Council Co-operative Awards in Science and Engineering). With this example a company wanted an extensive investigation of the performance of their devices and proposed solutions as to how they might develop their product range. The Research Council partially funded the student's fees and stipend, and the company put up £11k per annum for three years plus staff time, facilities and samples. The advantage to the academic is conference and journal publications on the underlying science involved as well as the development of a PhD student.

An example of a large collaborative project at the higher level, or gold level of interaction, involved multiple companies within a supply chain and was partially funded by the European Commission for four years. The whole project was costed at >£4M where the largest contributing company spent a total of 50 man-months and £200k on facilities and samples. An important outcome for many of the companies is that they could break into other market sectors with their products. Much intellectual property was created which was assigned to the appropriate parties.

The Table illustrates these three levels of academic-industrial interaction depending on the cost to the industrial company. The lowest level requires a minimal commitment from the industrialist and is mainly a commitment of some staff time. However, the highest level is at a more substantial cost equivalent to perhaps recruiting an additional staff member. Obviously, at all levels, the benefits must outweigh these costs. The main issue is that academia and industry talk and for both to be motivated to find some level of interaction for mutual benefit. What opportunities can you see?

Table Breakdown of Typical Costs to Industry for Different Levels of Interaction

Company Input	**Bronze**	**Silver**	**Gold**
Staff	< 60 hours / year	5-50 days/year	>2 months/year
Duration	< 1 year	1-4 years	> 3 years
Facilities / Samples	<£3k / year	< £15k / year	> £10k / year
Cash	Zero	< £15k / year	> £10k / year
Examples of Interaction	• Undergraduate Placements • 3rd Year Undergraduate Projects • MSc Projects	• PhD Studentships • EngD Programme • Smaller Collaborative Research Projects	• Larger Collaborative Research Projects • Secondment • Knowledge Transfer Partnerships

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